CHAPTER 4—ENVIRONMENTAL CONSEQUENCES

The purpose of this chapter is to determine the potential for significant impact of the "federal action" on the "human environment." The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act of 1969 (NEPA) states that the "human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment (40 Code of Federal Regulations [CFR] §1508.14). The "federal action" is the Bureau of Land Management's (BLM) or the U.S. Forest Service's (Forest Service) selection of resource management plan (RMP) and Land and Resource Management Plan (LRMP) amendments on which future land use actions will be based.

This chapter objectively evaluates the environmental impacts of implementing each management alternative described in Chapter 2. This chapter forms the analytic basis for the comparative summary of impacts presented in Chapter 2. Chapter 3 describes the existing conditions of the resources and resource uses that would be affected by the management alternatives. The organization of this chapter parallels that of Chapter 3, in that the resource programs are presented in the same order. Because resources and resource uses are often interrelated, one section may refer to another. In Chapter 2 under the Proposed Land Use Plan (LUP) Amendments, the Forest Service proposed core and proposed connectivity habitat is referenced, and subject to, management prescriptions. Therefore, throughout the Chapter 4 analysis, when sage-grouse core and connectivity habitat is mentioned under the Proposed LUP Amendments, it is assumed the analysis is referring to all core and connectivity habitat, including the Forest Service proposed core and proposed connectivity habitat.

This chapter describes the environmental consequences associated with the impacts to Greater Sage-Grouse and its habitat from activities carried out in conformance with this plan, coupled with the mitigation of those activities. In addition, to help implement these Wyoming Greater Sage-Grouse LUP Amendments, a Western Association of Fish, and Wildlife Agencies (WAFWA) Management Zone Regional Mitigation Strategy (Regional Mitigation Strategy) (per Appendix D) will be developed within one year of the issuance of the record of decision (ROD). The Regional Mitigation Strategy will elaborate on the components identified in Chapter 2 (avoidance, minimization, compensation, additionality, timeliness, and durability), and will be considered by the BLM/Forest Service for BLM/Forest Service management actions and third party actions that result in habitat loss and degradation. The implementation of a Regional Mitigation Strategy will benefit Greater Sage-Grouse, the public, and land-users by providing a reduction in threats, increased public transparency and confidence, and a predictable permit process for land-use authorization applicants.

4.1 ANALYSIS METHODS

The BLM manages public lands for multiple uses in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA). The FLPMA requires the BLM to manage public lands and resources according to the principles of multiple use and sustained yield, including recognizing the nation's needs for domestic sources of minerals, food, timber, and fiber. To ensure that the BLM meets its mandate of multiple use in land management actions, the impacts of the alternatives on resources and resource uses are identified and assessed as part of the planning process. The Forest Service is required by the National Forest Management Act of 1976 (NFMA), to prepare LRMPs to ensure that National Forest Service Lands are managed under the principles of multiple use and sustained yield.

The analysis of the alternatives is focused on identifying the types of impacts anticipated to occur and estimating their potential intensity. The analysis is organized by resource program and discloses the potential impacts on each resource program from implementing each of the proposed alternatives. The

impact analysis for Alternative A was prepared first to serve as the baseline for alternative comparison. It is important to note that management prescriptions for each resource or resource use directly or indirectly relate to each other; therefore, impacts on one particular resource program may also apply to other programs. It is, therefore, recommended that the reader review all impact analyses to attain a comprehensive description of the impacts on the resource or resource use in question.

Potential impacts of certain land use activities can be compared visually among the alternatives by using geographic information system (GIS) data. The locations of resources and management thereof are shown in Maps 2-1 through 2-35. The geographic implications associated with each management alternative are presented in Tables 2-2 through 2-4 in Chapter 2. These maps and tables should be reviewed in conjunction with the impact analyses.

Acreage calculations used in this analysis are approximate values for alternative comparison and analytic purposes only and do not reflect exact measurements of on-the-ground resources and actions. These acreage values were calculated using Esri ArcGIS Desktop 9.3.1 software. The projection of GIS data that was analyzed to provide the acreage calculations is USA Contiguous Albers Equal Area Conic, based on the North American Datum of 1983 (NAD83).

4.1.1 Types of Impacts

Throughout this chapter, the terms “impact” and “effect” are used interchangeably. Impacts can be direct, indirect, or cumulative. Impacts may be perceived as positive (beneficial) or negative (adverse). Some impacts would be positive for some individuals and negative for others; for example, restrictions on road development could benefit hikers but be a detriment to off-highway vehicle (OHV) users. For this reason, impacts are generally not labeled as beneficial or adverse, unless directed by law, regulation, or policy. The analysis of impacts compares the types and intensity of impacts among the alternatives. In some cases, adverse impacts that occur to resource values or uses under a particular alternative, are of a lower intensity as compared to other alternatives. In these cases, the reduction of an impact is considered a positive effect on the affected resource values or uses. Table 4-1 provides an overview of the general types of impacts discussed in this chapter.

Table 4-1. Types of Impacts

Type	Description
Direct Impacts	Direct impacts occur at the same time and place as the action responsible for the impact. For example, removal of vegetative cover caused by facility construction would be considered a direct impact on vegetation resources.
Indirect Impacts	Indirect impacts are temporally and spatially removed from the action responsible for the impact, but are related to the action through a process of cause and effect. For example, removal of vegetative cover caused by facility construction that consequently results in increased surface runoff and sedimentation of nearby streams would be considered an indirect impact on water resources. Indirect impacts may reach beyond the natural and physical environment (i.e., environmental impact) to include growth-inducing effects and other effects related to induced changes to resource uses (i.e., non-environmental impact).
Cumulative Impacts	Cumulative impacts result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over time.

4.1.2 Availability of Data and Incomplete Information

The BLM used the best information available and pertinent to the decisions to be made through these LUP Amendments, and has expended considerable effort to acquire and convert resource data into a digital format for use in the plan. Data have been acquired from BLM sources and outside sources, such as the state. Some information was not available for use in developing this plan, usually because there have been no inventories or inventories are not complete. Specific data not available include:

- Winter Concentration Areas
- Connectivity Habitat
- Nesting/Early brood-rearing habitat.

Because these data are not available, effects cannot be appropriately quantified given the proposed management of certain resources. In these cases, potential effects are described in qualitative terms or, in some cases, stated as unknown. Subsequent project-level analyses will provide the opportunity to collect and examine site-specific inventory data necessary to determine the appropriate application of the LUP-level guidance. In addition, inventory efforts identified in Chapter 2 will continue to update and refine the information used to implement these plans.

4.1.3 Analysis Assumptions

Assumptions for analysis are made to assist in determining the potential environmental, social, and economic impacts of the alternatives (Chapter 2) on the affected environment (Chapter 3). They are based on expected trends (e.g., population growth or decline within the planning area), expected demands (e.g., increases in certain kinds of recreational use), and the likelihood of resource development (e.g., the reasonably foreseeable development (RFD) scenario for oil and gas). Assumptions are for the purpose of analysis only. They are presumed true for the purpose of equitably comparing the alternatives, do not constrain or define management, and are based on observations, historical trends and professional judgment. Assumptions are generally made for the expected life of the RMPs and LRMPs, unless otherwise stated. General assumptions applicable to all resources and resource uses are described below. Resource-specific assumptions are described under each resource program in the sections that follow.

The following general assumptions were used in the environmental effects analysis:

- The decisions proposed in the alternatives apply to public lands and areas that require federal permitting or authorization. However, cumulative impact analyses also consider decisions made for resources managed by other entities or individuals.

- The planning criteria described in Chapter 1 apply to all alternatives.

- The alternatives will be implemented as described in Chapter 2 and associated appendices.

- Implementation actions will comply with valid existing rights and all federal laws, regulations, and policies.

- Sufficient funding and personnel will be available to implement the RMP and LRMP amendments.

- The State of Wyoming will apply the "Core Area Population" strategy (Wyoming Governor's Executive Order 2011-5) to all activities conducted or permitted by the State of Wyoming, including, but not limited to, regulation of locatable mineral exploration and development activities by the Wyoming Department of Environmental Quality (i.e., exploration by dozing [Wyoming Statute § 35-11-414], exploration by drilling [Wyoming Statute § 35-11-404], stormwater

discharge, mining operations [Wyoming Statute § 35-11-406 and the Noncoal Rules and Regulations, Chapters 2, 3, and 7], small mining operations [Wyoming Statute § 35-11-401(j), -406 and the Noncoal Rules and Regulations, Chapter 9], limited mining operations [Wyoming Statute § 35-11-401(e)(vi) and h, and the Noncoal Rules and Regulations, Chapter 10].

It is assumed that the best management practices (BMP) and required design features (RDF) identified in Appendix B are to be included at the project proposal stage on a case by case basis, depending upon the circumstances of what is applicable. RDFs (and BMPs) are measures that the agency applies to an authorization or lease at the site-specific level as a stipulation, mitigation measure, or conditions of approval (COAs), rather than applied universally through the RMP. It is not possible to evaluate all the known practices and make determinations as to which are best, particularly without a specific project in a specific location. These RDFs (and BMPs) will be matched and adapted to meet the site-specific requirements of the management action, project, and local environment. Therefore, during the site-specific analysis that will take place before the BLM/Forest Service approves an authorization, the BLM/Forest Service will evaluate which RDFs (and BMPs) are applicable for the project, and the public will have the opportunity to comment on the application of these RDFs (and BMPs) at that time.

Some of the RDFs identified in Appendix B have been incorporated into the Forest Service LUP amendments as planning level guidelines, which will be implemented during site specific project analysis or are existing standard operating procedures.

To help implement the Proposed LUP Amendments, a WAFWA Management Zone Regional Mitigation Strategy (per Appendix D) will be developed. The Regional Mitigation Strategy will help to guide the BLM/Forest Service in the development and implementation of mitigation activities associated with the impacts to Greater Sage-Grouse. The development and implementation of a Regional Mitigation Strategy will benefit Greater Sage-Grouse, the public, and land-users by providing a reduction in threats, increased public transparency and confidence, and a predictable permit process for land-use authorization applicants.

4.2 AIR QUALITY

This section presents potential impacts on air quality implementing management actions presented in Chapter 2. Existing conditions concerning air quality are described in Chapter 3 (Section 3.2).

4.2.1 Introduction

The impact of the proposed amendments to air quality resources is evaluated by addressing potential changes to ambient air quality and air quality related values (AQRV) (e.g., visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the Federal Land Manager for a particular area) for each field office area. Since the air quality impact assessments previously performed occurred at different times with sometimes differing technical approaches, this analysis will be primarily qualitative. Potential impacts on air quality from implementing the action alternatives (i.e., Alternatives B, C, and D, and the Proposed LUP Amendments) is qualitatively compared to the No Action Alternative (Alternative A) to determine what changes, if any, can be expected to air resources in each of the field offices. In addition, for oil and gas activities, emission change estimates for Alternatives B, C, and D, and the Proposed LUP Amendments from Alternative A were calculated in order to determine potential changes in air emissions.

It is important to mention that portions of the analysis area (Sublette and parts of Lincoln and Sweetwater Counties) are designated as non-attainment for ozone. As a result of the non-attainment designation, the BLM and other federal agencies within the area must comply with the 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 federal agencies must demonstrate that new actions occurring within the non-attainment area will conform with the Wyoming State Implementation Plan, either through an applicability analysis to demonstrate that the total of direct and indirect emissions from the proposed federal action do not exceed the de minimis emission levels specified in 40 CFR 93.153(b) or through a conformity determination if approval of the federal action will exceed the de minimis emission levels of 100 tons/year of nitrogen oxide (NO_x) or volatile organic compounds (VOC), which are 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 addition, any portion of the project or action that requires a permit under the State of Wyoming's New Source Review (NSR) or Prevention of Significant Deterioration (PSD) programs is also excluded from the federal agency's general conformity analysis per 40 CFR 93.153(d).

Since this analysis is a programmatic (planning level) document and no specific emission generating activities will be authorized, a Conformity analysis is not required at this time. Future activities with the potential to generate NO_x or VOC within the designated non-attainment area will be addressed at the project level stage, and the Conformity analysis or determination will be completed during that time.

4.2.2 Impact Indicators

Indicators of impacts on air quality are as follows:

- Attainment status of air quality in a given area
- Number and types of wells constructed and operated in a given area
- Amount of road traffic from construction, daily operation, inspections, and road maintenance.

4.2.3 Air Quality Assessments for Alternative A

Casper Field Office

The implementation of Alternative A could result in the emission of all air pollutants within the Casper Field Office. Because new or expanded individual development projects are likely to be widely separated throughout the planning area and current measured air quality concentrations are well below federal and Wyoming standards, it is unlikely that the increased emissions will contribute to an exceedance of a national or state ambient air quality standard. In addition, since emissions increases will be spread over relatively large distances, this alternative is not expected to cause adverse impacts to AQRVs in the nearby sensitive Class I air quality areas.

Kemmerer Field Office

The implementation of Alternative A could result in the emission of all air pollutants within the Kemmerer Field Office. Because new or expanded individual development projects are likely to be widely separated throughout the planning area and current measured air quality concentrations are well below federal and Wyoming standards, it is unlikely that the increased emissions will contribute to an exceedance of a national or state ambient air quality standard. However, parts of Kemmerer Field Office are in a non-attainment area for ozone. AQRVs in adjacent and nearby wilderness areas are already being significantly impacted.

Newcastle Field Office

The implementation of Alternative A could result in the emission of all air pollutants within the Newcastle Field Office. The emissions from the new oil wells could cause the increased emissions which could contribute to an exceedance of a national or state ambient air quality standard.

Pinedale Field Office

The implementation of Alternative A could result in the emission of all air pollutants within the Pinedale Field Office. Parts of the Pinedale Field Office are in a non-attainment area for ozone. AQRVs in adjacent and nearby wilderness areas are already being significantly impacted. The emissions from the new natural gas, coalbed natural gas (CBNG), and oil wells could cause the increased emissions to contribute to an exceedance of a national or state ambient air quality standard.

Rawlins Field Office

The implementation of Alternative A could result in the emission of all air pollutants within the Rawlins Field Office. The emissions from the new natural gas, CBNG, and oil wells could cause the increased emissions to contribute to an exceedance of a national or state ambient air quality standard.

Rock Springs Office

The implementation of Alternative A could result in the emission of all air pollutants within the Rock Springs Field Office. The emissions from the new natural gas, CBNG, and oil wells could cause the increased emissions to contribute to an exceedance of a national or state ambient air quality standard. In addition, under this alternative, impacts to AQRVs from proposed activities within the planning area could be significant since parts of the Rock Spring Field Office are in non-attainment for ozone.

Bridger-Teton National Forest

The implementation of Alternative A could result in the emission of all air pollutants within the Bridger-Teton National Forest (BTNF). The most significant increase would be from NO_x. It is likely that the increased emissions will contribute to an exceedance of a national or state ambient air quality standard.

Impacts to AQRVs are already occurring within the Bridger Wilderness, additional development in the area will likely increase these impacts. Parts of the BTNF are in an ozone non-attainment area.

Thunder Basin National Grassland

The implementation of Alternative A could result in the emission of all air pollutants within the Thunder Basin National Grassland (TBNG). In addition, under this alternative, impacts to AQRVs from proposed activities within the planning area are not anticipated to be significant.

Medicine Bow National Forest

The implementation of Alternative A is not likely to result in the emission of air pollutants within the Medicine Bow National Forest (MBNF), since no new wells are projected to be installed.

4.2.4 Air Quality Impacts Associated with Oil and Gas Development

The oil and gas activities anticipated in the planning area under Alternative A will cause emissions of criteria air pollutants plus hazardous air pollutants (HAP) and greenhouse gases (GHG). Because the oil and gas activities identified for each of the other alternatives will be less than those anticipated for Alternative A, emissions will be reduced under all the action alternatives compared to those estimated under Alternative A.

Assumptions

In this section, the emission reductions are quantified using the best available engineering data and assumptions, air emissions inventory processes, as well as professional and scientific judgment. However, assumptions were used where specific data or procedures were not available. The air emissions for oil and gas development were calculated using the latest emissions data estimated for the Buffalo and Lander Environment Impact Statements (EIS) (BLM 2010). There can be limitations associated with a qualitative approach, but given the uncertainties regarding the number, nature, and specific location of future sources and activities, this emissions analysis provides a sound basis to compare alternatives. The estimated emissions were determined using the following assumptions:

- U.S. Environmental Protection Agency (EPA) and State of Wyoming approved emission factors recognized by state and federal agencies are appropriate for all activities (BLM 2010).
- The Buffalo and Lander RMP assumptions for oil and gas field development and operations (BLM 2010) are the basis for calculating typical criteria pollutant and greenhouse gas emissions per well for both CBNG and conventional natural gas wells. (See Table 4-3 and Table 4-4 for total emissions for each alternative).
- 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.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

The well numbers used for each alternative are shown in Table 4-2.

Table 4-2. Total Number of Wells

Analysis Area	Alternative A					Alternative B					Alternative C				
	Oil	Gas	Horiz. (Oil)	Horiz. (Gas)	CBNG	Oil	Gas	Horiz. (Oil)	Horiz. (Gas)	CBNG	Oil	Gas	Horiz. (Oil)	Horiz. (Gas)	CBNG
Casper	638	146	275	0	508	385	88	166	0	415	311	71	134	0	380
Kemmerer	28	664	0	10	285	24	563	0	8	210	20	477	0	7	116
Newcastle	281	13	10	0	23	231	10	8	0	14	154	7	5	0	0
Pinedale	376	4,287	0	31	372	355	4,057	0	30	343	321	3,661	0	27	242
Rawlins	203	1,628	0	10	1,331	184	1,477	0	10	973	113	910	0	6	764
Rock Springs	524	4,132	0	105	149	407	3,213	0	82	117	358	2,821	0	72	64
Bridger-Teton	13	145	0	0	8	13	146	0	0	10	2	23	0	0	0
Thunder Basin	87	1	47	0	81	8	90	34	0	74	21	0	12	0	28
Medicine Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Wells	**2,148**	**11,017**	**333**	**157**	**2,757**	**1,607**	**9,644**	**209**	**130**	**2,156**	**1,300**	**7,971**	**152**	**112**	**1,594**

Analysis Area	Alternative D					Proposed LUP Amendments				
Casper	597	137	258	0	496	502	115	217	0	458
Kemmerer	28	654	0	10	279	26	607	0	9	255
Newcastle	265	12	9	0	21	256	11	9	0	17
Pinedale	355	4,053	0	30	364	353	4,034	0	30	351
Rawlins	201	1,613	0	10	1,291	190	1,525	0	10	1,167
Rock Springs	502	3,960	0	101	144	460	3,630	0	92	125
Bridger-Teton	13	145	0	0	8	13	145	0	0	8
Thunder Basin	85	1	46	0	82	77	1	42	0	80
Medicine Bow	0	0	0	0	0	0	0	0	0	0
Total Wells	**2,045**	**10,576**	**314**	**151**	**2,685**	**1,877**	**10,071**	**268**	**141**	**2,461**

The total criteria pollutant and greenhouse gas emissions for each well type for each alternative in year 2020 and 2031 are provided in Table 4-3 through Table 4-4. Since the well counts for each year were not linear, only emissions during 2020 and 2031 were analyzed. Those years were chosen because they represented the peak construction emissions and the peak production emission. When comparing emissions between 2020 and

2031, emissions in 2031 are less than in 2020. This is due in part to the majority of the well construction activities, which generate a significant portion of the emissions, decreasing in 2020.

Table 4-3. Total Criteria Pollutant Emissions for Each Well Type for all Field Offices by Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	740	751	200	202	3,588	4,110	57	9	1,640	2,078	6,713	9,294	962	1,339
	CBNG	522	411	137	112	2,664	2,532	13	6	1,289	1,266	1,416	1,497	372	398
	Oil	237	180	181	35	1,689	421	231	50	408	104	72	18	9	2
	H. NG	46	54	14	17	230	301	3	1	120	173	121	180	30	46
	H. Oil	3	26	0	3	1	1	0	0	0	1	0	0	0	0
B	NG	694	519	188	135	3,384	2,333	52	16	1,553	1,060	6,379	4,124	915	591
	CBNG	322	249	84	68	1,624	1,543	8	4	785	771	860	912	226	242
	Oil	190	141	144	28	1,360	340	186	40	328	84	58	14	7	1
	H. NG	26	39	8	12	128	214	2	1	64	123	63	127	15	32
	H. Oil	169	18	93	2	1,822	0	220	0	432	1	73	0	7	0
C	NG	527	536	143	144	2,594	2,936	39	6	1,198	1,484	4,961	6,640	712	957
	CBNG	184	140	49	38	938	865	5	2	453	432	495	511	130	136
	Oil	128	107	99	22	870	267	119	32	210	66	37	11	4	1
	H. NG	24	6	8	1	121	0	2	0	63	0	63	0	15	0
	H. Oil	26	11	10	1	173	0	22	0	41	0	7	0	1	0
D	NG	711	725	192	195	3,456	3,971	54	9	1,583	2,007	6,495	8,979	931	1,294
	CBNG	500	389	130	106	2,534	2,403	13	6	1,226	1,201	1,344	1,420	353	378
	Oil	239	171	180	34	1,785	400	240	48	430	99	76	17	9	2
	H. NG	38	51	12	16	189	286	3	1	98	165	98	171	24	44
	H. Oil	53	27	21	3	376	1	47	0	89	1	15	0	2	0
	NG	783	578	209	152	3,632	2,776	58	14	1,623	1,311	6,410	5,391	918	775

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
Proposed LUP Amendments	CBNG	429	327	111	89	2,151	2,023	11	5	1,038	1,011	1,134	1,196	298	318
	Oil	194	149	148	29	1,367	344	189	41	330	85	59	14	7	1
	H. NG	37	23	11	5	183	38	3	1	95	11	95	5	23	0
	H. Oil	48	22	19	2	334	1	41	0	79	1	13	0	1	0

Table 4-4. Total Greenhouse Gas Emissions for Well type for all Field Offices by Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	1,241,601	1,646,344	47,728	67,221	11	15	2,247,360	3,062,567	2,128,963	2,905,607
	CBNG	952,936	1,000,826	50,640	54,601	8	9	2,018,969	2,150,226	1,832,095	1,951,204
	Oil	77,670	21,035	2,915	1	1	0	78,005	21,129	73,483	19,109
	H. NG	71,108	104,816	140	219	1	1	74,246	109,713	67,464	99,719
	H. Oil	93	212	0	0	0	0	94	213	85	192
B	NG	1,178,004	781,437	45,414	29,335	11	7	2,134,995	1,399,663	2,022,664	1,325,140
	CBNG	578,693	609,707	30,713	33,256	5	5	1,225,233	1,309,763	1,111,827	1,188,533
	Oil	62,516	16,933	2,384	1	1	0	62,786	17,009	59,184	15,383
	H. NG	37,385	74,086	71	154	0	1	38,984	77,533	35,418	70,469
	H. Oil	84,665	145	4	0	1	0	85,030	147	76,912	132
C	NG	912,266	1,175,951	35,344	48,025	8	11	1,657,051	2,187,743	1,570,060	2,075,630
	CBNG	333,423	341,816	17,678	18,635	3	3	705,563	734,091	640,257	666,144
	Oil	39,959	13,255	1,559	1	0	0	40,132	13,315	37,865	12,042
	H. NG	36,981	0	72	0	0	0	38,603	0	35,076	0
	H. Oil	8,203	87	0	0	0	0	8,238	88	7,451	79

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
D	NG	1,199,804	1,590,496	46,193	64,942	11	14	2,173,214	2,958,706	2,058,803	2,807,070
	CBNG	904,723	949,698	48,048	51,811	8	8	1,916,188	2,040,360	1,738,828	1,851,507
	Oil	82,137	19,990	2,708	1	1	0	82,492	20,080	77,333	18,160
	H. NG	57,552	99,539	112	208	1	1	60,071	104,189	54,583	94,698
	H. Oil	17,760	222	1	0	0	0	17,837	224	16,134	202
Proposed LUP Amendments	NG	1,206,581	994,147	45,393	38,615	11	9	2,163,220	1,807,840	2,048,154	1,713,044
	CBNG	763,613	799,328	40,503	43,604	7	7	1,616,257	1,717,234	1,466,658	1,558,288
	Oil	62,862	17,226	2,526	1	1	0	63,133	17,303	59,641	15,649
	H. NG	56,034	4,481	110	0	1	0	58,496	4,496	53,152	4,067
	H. Oil	15,806	177	1	0	0	0	15,874	178	14,358	161

Casper Field Office

Table 4-5 and Table 4-6 show the total emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal oil wells in the Casper Field Office for each alternative. Table 4-7 and Table 4-8 show the criteria pollutant and greenhouse gas emissions reductions for the Casper Field Office compared to Alternative A. The greatest reduction in criteria pollutant emissions would occur under Alternative C, and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions are also less under all alternatives with Alternative C having the greatest reduction in emissions.

Table 4-5. Casper Field Office Total Criteria Pollutant Emissions for Year 2020 and 2031 for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	12	13	3	3	61	71	1	0	28	36	116	160	17	23
	CBNG	101	81	27	22	522	500	3	1	253	250	279	296	73	79
	Oil	86	42	66	4	621	1	85	0	150	2	27	0	3	0
	H. NG	30	25	8	8	140	149	2	0	75	87	77	92	19	23

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. Oil	3	19	0	2	1	0	0	0	0	1	0	0	0	0
B	NG	8	8	2	2	39	43	1	0	18	22	73	97	10	14
	CBNG	66	52	17	14	335	319	2	1	162	160	178	189	47	50
	Oil	58	25	43	3	437	1	59	0	105	1	19	0	2	0
	H. NG	17	15	5	5	76	90	1	0	39	53	40	55	10	14
	H. Oil	153	12	86	1	1,693	0	204	0	401	0	67	0	7	0
C	NG	6	6	2	2	31	35	0	0	14	17	58	78	8	11
	CBNG	46	35	13	10	239	216	1	1	115	108	124	128	33	34
	Oil	43	20	32	2	317	1	42	0	76	1	13	0	2	0
	H. NG	15	3	4	0	68	0	1	0	37	0	37	0	9	0
	H. Oil	24	9	10	1	172	0	21	0	41	0	7	0	1	0
D	NG	12	12	3	3	57	66	1	0	26	33	109	150	16	22
	CBNG	97	77	25	21	498	476	2	1	241	238	266	281	70	75
	Oil	80	39	61	4	571	1	78	0	138	2	24	0	3	0
	H. NG	28	23	8	8	130	140	2	0	70	82	72	86	18	22
	H. Oil	38	15	15	2	270	0	33	0	64	1	11	0	1	0
Proposed LUP Amendments	NG	10	10	3	3	49	56	1	0	23	28	93	126	13	18
	CBNG	84	65	22	18	426	403	2	1	206	201	226	238	59	63
	Oil	66	31	50	3	481	1	66	0	116	1	21	0	2	0
	H. NG	23	11	6	2	108	18	1	0	57	5	59	2	15	0
	H. Oil	39	15	16	2	286	0	35	0	68	1	11	0	1	0

Table 4-6. Casper Field Office Total Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	21,343	28,331	826	1,157	0	0	38,738	52,703	36,703	50,002
	CBNG	187,945	197,652	10,001	10,783	2	2	398,475	424,645	361,592	385,341
	Oil	28,537	490	1,050	0	0	0	28,660	494	26,978	445
	H. NG	45,035	53,186	91	112	0	0	47,064	55,696	42,769	50,625
	H. Oil	79	153	0	0	0	0	79	155	72	139
B	NG	13,440	17,093	517	698	0	0	24,340	31,798	23,059	30,169
	CBNG	119,788	126,280	6,361	6,888	1	1	253,698	271,274	230,216	246,165
	Oil	20,093	301	668	0	0	0	20,180	303	18,923	274
	H. NG	23,409	32,097	46	68	0	0	24,444	33,612	22,212	30,551
	H. Oil	78,574	100	4	0	1	0	78,914	101	71,380	91
C	NG	10,744	13,828	416	565	0	0	19,500	25,726	18,476	24,408
	CBNG	83,708	85,527	4,423	4,663	1	1	176,822	183,680	160,456	166,679
	Oil	14,599	242	461	0	0	0	14,662	243	13,724	220
	H. NG	21,854	0	44	0	0	0	22,835	0	20,751	0
	H. Oil	8,123	72	0	0	0	0	8,158	72	7,379	65
D	NG	19,998	26,538	775	1,084	0	0	36,325	49,368	34,418	46,838
	CBNG	178,823	187,947	9,509	10,253	2	2	378,993	403,790	343,914	366,416
	Oil	26,252	459	978	0	0	0	26,365	462	24,829	417
	H. NG	41,954	49,821	85	105	0	0	43,847	52,172	39,846	47,422
	97,960	12,745	125	1	0	0	0	12,800	126	11,578	113
Proposed LUP Amendments	NG	17,123	22,310	662	911	0	0	31,071	41,503	29,438	39,376
	CBNG	151,828	159,081	8,061	8,678	1	1	321,519	341,760	291,760	310,127
	Oil	22,112	371	820	0	0	0	22,208	373	20,910	337

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	34,287	2,158	69	0	0	0	35,826	2,165	32,556	1,959
	H. Oil	13,496	124	1	0	0	0	13,555	125	12,260	113

Table 4-7. Casper Field Office Oil and Gas Criteria Pollutant Emission Reductions Compared to Alternative A (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	4	5	1	1	22	28	0	0	10	14	43	63	6	9
	CBNG	35	30	9	8	187	181	1	0	91	90	101	107	27	28
	Oil	29	16	23	2	184	0	26	0	44	1	8	0	1	0
	H. NG	13	10	4	3	65	59	1	0	36	35	37	36	9	9
	H. Oil	-151	6	-85	1	-1,692	0	-204	0	-401	0	-67	0	-7	0
C	NG	6	7	2	2	30	36	0	0	14	18	58	82	8	12
	CBNG	55	46	14	13	283	284	1	1	138	142	155	168	41	45
	Oil	44	21	34	2	303	1	42	0	73	1	13	0	2	0
	H. NG	15	22	4	8	72	149	1	0	39	87	40	92	10	23
	H. Oil	-21	10	-10	1	-171	0	-21	0	-41	0	-7	0	-1	0
D	NG	1	1	0	0	4	4	0	0	2	2	7	10	1	1
	CBNG	4	4	1	1	24	24	0	0	12	12	14	15	4	4
	Oil	6	3	5	0	50	0	7	0	12	0	2	0	0	0
	H. NG	2	2	1	1	10	9	0	0	5	6	5	6	1	1
	H. Oil	-35	3	-15	0	-269	0	-33	0	-64	0	-11	0	-1	0
Proposed LUP Amendments	NG	2	3	1	1	12	15	0	0	6	8	23	34	3	5
	CBNG	17	16	5	4	96	97	0	0	47	49	54	58	14	15

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	Oil	21	10	16	1	140	0	19	0	34	0	6	0	1	0
	H. NG	7	13	2	6	33	131	0	0	18	82	18	90	5	23
	H. Oil	-37	3	-16	0	-285	0	-35	0	-67	0	-11	0	-1	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-8. Casper Field Office Oil and Gas Greenhouse Gas Emission Reductions Compared to Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	7,903	11,239	308	459	0	0	14,398	20,904	13,644	19,833
	CBNG	68,157	71,371	3,640	3,895	1	1	144,777	153,371	131,377	139,176
	Oil	8,444	189	383	0	0	0	8,481	190	8,055	172
	H. NG	21,627	21,089	44	45	0	0	22,619	22,084	20,557	20,073
	H. Oil	-78,495	54	-4	0	-1	0	-78,834	54	-71,308	49
C	NG	10,599	14,503	410	592	0	0	19,238	26,976	18,227	25,594
	CBNG	104,238	112,125	5,578	6,120	1	1	221,652	240,966	201,137	218,662
	Oil	13,938	249	590	0	0	0	13,998	250	13,254	226
	H. NG	23,181	53,186	47	112	0	0	24,228	55,696	22,018	50,625
	H. Oil	-8,044	82	0	0	0	0	-8,078	82	-7,307	74
D	NG	1,345	1,793	51	73	0	0	2,413	3,335	2,285	3,164
	CBNG	9,122	9,705	492	530	0	0	19,481	20,855	17,678	18,925
	Oil	2,285	31	73	0	0	0	2,295	31	2,149	28
	H. NG	3,081	3,365	6	7	0	0	3,217	3,524	2,923	3,203
	H. Oil	-12,666	29	-1	0	0	0	-12,721	29	-11,506	26
	NG	4,220	6,022	164	246	0	0	7,667	11,200	7,265	10,626

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
Proposed LUP Amendments	CBNG	36,118	38,571	1,940	2,105	0	0	76,955	82,885	69,833	75,213
	Oil	6,425	119	230	0	0	0	6,453	120	6,068	108
	H. NG	10,748	51,028	22	112	0	0	11,238	53,530	10,213	48,666
	H. Oil	-13,417	29	-1	0	0	0	-13,475	30	-12,189	27

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Kemmerer Field Office

Table 4-9 and Table 4-10 show the total criteria pollutant and greenhouse gas emissions natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the Kemmerer Field Office for each alternative. Table 4-11 and Table 4-12 show the estimated criteria pollutant and greenhouse gas emissions reductions for the Kemmerer Field Office compared to Alternative A. The greatest reduction in emissions would occur under Alternative C and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions are also less under all of the alternatives compared to Alternative A.

Table 4-9. Kemmerer Field Office Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	60	59	16	16	286	321	5	1	130	162	528	727	76	105
	CBNG	61	46	16	12	300	281	2	1	145	140	157	166	41	44
	Oil	4	2	3	0	34	0	5	0	8	0	1	0	0	0
	H. NG	1	1	1	0	9	6	0	0	4	3	3	3	1	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	NG	51	50	14	13	248	272	4	1	114	138	464	616	67	89
	CBNG	36	26	9	7	174	162	1	0	84	81	90	96	24	25
	Oil	4	2	3	0	28	0	4	0	7	0	1	0	0	0
	H. NG	1	0	1	0	7	2	0	0	3	0	2	0	1	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	43	42	12	11	207	231	3	1	95	117	390	522	56	75
	CBNG	15	11	4	3	74	66	0	0	35	33	38	39	10	10
	Oil	3	1	2	0	22	0	3	0	5	0	1	0	0	0
	H. NG	1	0	0	0	6	0	0	0	3	0	2	0	1	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	59	58	16	16	282	316	4	1	128	160	521	715	75	103
	CBNG	58	43	15	12	286	267	2	1	138	134	150	158	39	42
	Oil	20	2	12	0	242	0	29	0	58	0	10	0	1	0
	H. NG	1	1	1	0	9	6	0	0	4	3	3	3	1	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	144	54	36	14	514	294	10	1	191	149	523	665	74	96
	CBNG	50	36	13	10	243	224	1	1	117	112	126	132	33	35
	Oil	4	2	3	0	30	0	4	0	7	0	1	0	0	0
	H. NG	1	0	1	0	8	1	0	0	3	0	3	0	1	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-10. Kemmerer Field Office Total Oil and Gas Well Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	98,053	128,742	3,751	5,257	1	1	177,103	239,489	167,753	227,215
	CBNG	105,899	110,887	5,611	6,050	1	1	224,011	238,236	203,277	216,185
	Oil	1,556	22	46	0	0	0	1,563	22	1,460	20

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	2,069	1,993	3	4	0	0	2,143	2,083	1,945	1,893
	H. Oil	0	0	0	0	0	0	0	0	0	0
B	NG	85,911	109,104	3,302	4,455	1	1	155,489	202,970	147,296	192,569
	CBNG	60,886	63,901	3,219	3,485	1	1	128,647	137,271	116,740	124,565
	Oil	1,278	19	41	0	0	0	1,284	19	1,203	17
	H. NG	1,575	186	2	0	0	0	1,628	186	1,478	169
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	72,075	92,411	2,777	3,774	1	1	130,592	171,921	123,719	163,111
	CBNG	25,579	26,108	1,350	1,423	0	0	54,004	56,071	49,005	50,881
	Oil	1,024	16	30	0	0	0	1,028	16	960	14
	H. NG	1,470	0	2	0	0	0	1,523	0	1,382	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	96,648	126,722	3,700	5,174	1	1	174,614	235,734	165,398	223,653
	CBNG	100,971	105,720	5,349	5,768	1	1	213,567	227,132	193,800	206,109
	Oil	11,215	21	1	0	0	0	11,264	21	10,188	19
	H. NG	2,018	1,962	3	4	0	0	2,090	2,051	1,898	1,864
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	120,275	117,726	3,493	4,807	1	1	193,979	219,008	182,500	207,784
	CBNG	84,884	88,571	4,488	4,832	1	1	179,363	190,281	162,761	172,669
	Oil	1,373	19	42	0	0	0	1,379	19	1,289	17
	H. NG	1,841	89	3	0	0	0	1,906	90	1,730	81
	H. Oil	0	0	0	0	0	0	0	0	0	0

Table 4-11. Kemmerer Field Office Oil and Gas Criteria Pollutant Emission Reductions Compared to Alternative A (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	8	9	2	2	38	49	1	0	17	25	64	111	9	16
	CBNG	25	35	6	9	126	214	1	1	61	107	67	127	18	34
	Oil	1	0	1	-1	6	-2	1	-2	1	-2	0	-2	0	-2
	H. NG	0	0	0	0	2	0	0	0	1	0	1	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	17	17	5	4	79	91	1	0	35	46	138	205	20	30
	CBNG	46	2	12	1	227	13	1	0	109	7	119	8	31	2
	Oil	1	1	1	-1	12	-1	2	-1	3	-1	0	-1	0	-1
	H. NG	0	1	0	1	3	1	0	1	1	1	1	1	0	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	1	1	0	0	4	5	0	0	2	3	7	11	1	2
	CBNG	3	9	1	3	14	56	0	0	7	28	7	33	2	9
	Oil	-16	0	-9	-2	-209	-2	-25	-2	-49	-2	-8	-2	-1	-2
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	-84	5	-20	1	-228	27	-5	0	-61	14	5	62	2	9
	CBNG	11	0	3	0	58	0	0	0	28	0	31	0	8	0
	Oil	1	0	0	-1	4	-2	1	-2	1	-2	0	-2	0	-2
	H. NG	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-12. Kemmerer Field Office Oil and Gas Greenhouse Gas Emission Reductions Compared to Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	12,142	19,638	449	801	0	0	21,615	36,519	20,457	34,646
	CBNG	45,013	84,779	2,392	4,626	0	1	95,364	182,165	86,537	165,304
	Oil	278	20	5	-2	0	-2	279	20	257	18
	H. NG	494	0	1	0	0	0	515	0	468	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	25,978	36,331	974	1,483	0	0	46,511	67,568	44,034	64,104
	CBNG	80,319	5,167	4,260	282	1	0	170,007	11,104	154,271	10,076
	Oil	532	20	16	-1	0	-1	534	20	500	18
	H. NG	599	1	1	1	0	1	620	1	563	1
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	1,405	2,020	51	82	0	0	2,489	3,755	2,355	3,563
	CBNG	4,927	22,316	262	1,218	0	0	10,444	47,955	9,477	43,516
	Oil	-9,659	20	46	-2	0	-2	-9,701	20	-8,728	18
	H. NG	51	0	0	0	0	0	52	0	48	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	-22,222	11,016	258	449	0	0	-16,875	20,481	-14,747	19,431
	CBNG	21,015	0	1,123	0	0	0	44,648	0	40,516	0
	Oil	183	20	4	-2	0	-2	184	20	171	18
	H. NG	228	0	0	0	0	0	237	0	215	0
	H. Oil	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Newcastle Field Office

Table 4-13 and Table 4-14 show the total criteria pollutant and greenhouse emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the Newcastle Field Office for each alternative. Table 4-15 and Table 4-16 show the estimated range of criteria pollutant and greenhouse gas emissions reductions for the Newcastle Field Office compared to Alternative A. The greatest reduction in emissions would occur under Alternative C and the least reduction in emissions would occur under Alternative D and the Proposed LUP Amendments. Carbon dioxide equivalent emissions are also less under all alternatives with Alternative C showing the greatest reduction in emissions.

Table 4-13. Newcastle Field Office Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	1	1	0	0	5	6	0	0	2	3	10	14	1	2
	CBNG	5	4	1	1	25	23	0	0	12	11	13	13	3	4
	Oil	30	18	24	2	174	0	25	0	42	1	8	0	1	0
	H. NG	1	1	0	0	5	5	0	0	3	3	3	3	1	1
	H. Oil	0	1	0	0	0	0	0	0	0	0	0	0	0	0
B	NG	1	1	0	0	4	5	0	0	2	3	9	11	1	2
	CBNG	3	2	1	0	13	11	0	0	6	5	6	6	2	2
	Oil	25	15	20	2	151	0	22	0	37	1	7	0	1	0
	H. NG	0	1	0	0	0	4	0	0	0	3	0	3	0	1
	H. Oil	8	1	5	0	93	0	11	0	22	0	4	0	0	0
C	NG	0	1	0	0	3	3	0	0	1	2	6	8	1	1
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	9	10	9	1	14	0	4	0	4	0	1	0	0	0
	H. NG	0	0	0	0	2	0	0	0	1	0	1	0	0	0
	H. Oil	0	0	0	0	1	0	0	0	0	0	0	0	0	0
D	NG	1	1	0	0	5	6	0	0	2	3	9	13	1	2
	CBNG	6	3	1	1	24	20	0	0	11	10	11	12	3	3

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	Oil	28	17	23	2	160	0	23	0	39	1	7	0	1	0
	H. NG	1	1	0	0	5	5	0	0	2	3	3	3	1	1
	H. Oil	1	1	0	0	6	0	1	0	1	0	0	0	0	0
Proposed LUP Amendments	NG	1	1	0	0	5	6	0	0	2	3	9	13	1	2
	CBNG	4	2	1	1	17	15	0	0	8	7	8	9	2	2
	Oil	25	16	20	2	137	0	21	0	34	1	6	0	1	0
	H. NG	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	H. Oil	1	1	0	0	7	0	1	0	2	0	0	0	0	0

Table 4-14. Newcastle Field Office Total Oil and Gas Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	1,805	2,438	71	100	0	0	3,302	4,535	3,130	4,302
	CBNG	8,585	8,949	453	488	0	0	18,116	19,226	16,440	17,447
	Oil	7,962	216	462	0	0	0	7,997	217	7,697	196
	H. NG	1,591	1,908	3	4	0	0	1,663	1,998	1,512	1,816
	H. Oil	2	6	0	0	0	0	2	6	2	5
B	NG	1,546	2,011	61	82	0	0	2,829	3,741	2,681	3,549
	CBNG	4,143	4,260	215	232	0	0	8,661	9,151	7,859	8,304
	Oil	6,904	181	402	0	0	0	6,934	183	6,675	165
	H. NG	39	1,575	0	3	0	0	39	1,649	35	1,499
	H. Oil	4,306	5	0	0	0	0	4,325	5	3,912	4
C	NG	993	1,335	40	55	0	0	1,838	2,484	1,744	2,357

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	624	119	227	0	0	0	626	120	795	108
	H. NG	843	0	2	0	0	0	883	0	802	0
	H. Oil	39	3	0	0	0	0	40	3	36	3
D	NG	1,705	2,301	67	94	0	0	3,120	4,280	2,958	4,061
	CBNG	7,732	7,957	403	434	0	0	16,207	17,096	14,706	15,514
	Oil	7,323	204	433	0	0	0	7,355	205	7,088	185
	H. NG	1,494	1,801	3	4	0	0	1,562	1,886	1,420	1,714
	H. Oil	297	5	0	0	0	0	298	5	269	4
Proposed LUP Amendments	NG	1,669	2,220	66	91	0	0	3,057	4,130	2,898	3,919
	CBNG	5,713	5,905	299	322	0	0	12,012	12,685	10,900	11,511
	Oil	6,278	189	417	0	0	0	6,305	190	6,122	172
	H. NG	36	90	0	0	0	0	36	90	33	81
	H. Oil	322	5	0	0	0	0	323	5	292	5

Table 4-15. Newcastle Field Office Oil and Gas Criteria Pollutant Emission Reductions Compared to Alternative A (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	0	0	0	0	1	1	0	0	0	1	1	2	0	0
	CBNG	2	4	1	1	12	23	0	0	6	11	7	13	2	4
	Oil	4	3	4	-13	23	-15	3	-15	6	-15	1	-15	0	-15
	H. NG	1	0	0	0	4	1	0	0	3	1	3	1	1	0
	H. Oil	-8	0	-5	0	-93	0	-11	0	-22	0	-4	0	0	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
C	NG	1	1	0	0	2	3	0	0	1	1	4	6	1	1
	CBNG	5	0	1	0	25	3	0	0	12	1	13	1	3	0
	Oil	21	5	15	-8	159	-10	21	-10	38	-9	7	-10	1	-10
	H. NG	1	1	0	0	2	5	0	0	1	3	1	3	0	1
	H. Oil	0	0	0	0	-1	0	0	0	0	0	0	0	0	0
D	NG	0	0	0	0	0	0	0	0	0	0	1	1	0	0
	CBNG	0	1	0	0	1	8	0	0	1	4	1	5	0	1
	Oil	2	-7	2	-16	14	-17	2	-17	3	-17	1	-17	0	-17
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	-1	0	0	0	-6	0	-1	0	-1	0	0	0	0	0
Proposed LUP Amendments	NG	0	0	0	0	0	1	0	0	0	0	1	1	0	0
	CBNG	1	0	0	0	8	0	0	0	4	0	4	0	1	0
	Oil	5	1	4	-14	37	-15	5	-16	9	-15	2	-16	0	-16
	H. NG	1	0	0	0	5	5	0	0	3	3	3	3	1	1
	H. Oil	-1	0	0	0	-7	0	-1	0	-2	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-16. Newcastle Field Office Oil and Gas Greenhouse Gas Emission Reductions Compared to Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	259	427	10	17	0	0	473	793	448	753
	CBNG	4,442	8,949	238	488	0	0	9,456	19,226	8,581	17,447
	Oil	1,058	200	60	-15	0	-15	1,063	202	1,022	181
	H. NG	1,552	334	3	1	0	0	1,625	349	1,477	317

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. Oil	-4,304	1	0	0	0	0	-4,323	1	-3,910	1
C	NG	812	1,102	31	45	0	0	1,464	2,051	1,386	1,946
	CBNG	8,585	991	453	54	0	0	18,116	2,130	16,440	1,933
	Oil	7,339	171	235	-10	0	-10	7,370	173	6,902	155
	H. NG	747	1,908	1	4	0	0	781	1,998	710	1,816
	H. Oil	-38	3	0	0	0	0	-38	3	-34	2
D	NG	100	137	4	6	0	0	181	254	172	241
	CBNG	853	3,044	50	166	0	0	1,910	6,541	1,733	5,935
	Oil	639	102	29	-17	0	-17	642	103	609	91
	H. NG	97	107	0	0	0	0	101	112	92	102
	H. Oil	-295	1	0	0	0	0	-296	1	-268	1
Proposed LUP Amendments	NG	137	217	5	9	0	0	245	404	232	384
	CBNG	2,871	0	154	0	0	0	6,105	0	5,540	0
	Oil	1,685	188	45	-16	0	-16	1,692	189	1,576	169
	H. NG	1,554	1,818	3	4	0	0	1,627	1,908	1,479	1,735
	H. Oil	-320	0	0	0	0	0	-322	0	-291	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Pinedale Field Office

Table 4-17 and Table 4-18 show the total criteria pollutant and greenhouse gas emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the Pinedale Field Office for each alternative. Table 4-19 and Table 4-20 show the estimated emissions reductions for the Pinedale Field Office compared to Alternative A. The greatest reduction in emissions would occur under Alternative C and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions are also less under all alternatives with Alternative C showing the greatest reduction in emissions.

Table 4-17. Pinedale Field Office Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	359	379	98	102	1,774	2,075	28	5	819	1,049	3,400	4,692	488	676
	CBNG	83	59	21	16	398	366	2	1	191	183	206	216	54	58
	Oil	49	25	38	2	346	1	48	0	84	1	15	0	2	0
	H. NG	3	3	1	1	16	17	0	0	9	10	9	11	2	3
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	NG	347	192	94	47	1,726	540	26	12	800	153	3,337	68	479	7
	CBNG	60	43	15	12	287	264	2	1	138	132	148	156	39	42
	Oil	46	24	36	2	320	1	44	0	77	1	14	0	2	0
	H. NG	1	4	0	1	2	22	0	0	0	13	0	14	0	3
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	308	323	84	87	1,538	1,772	23	4	715	896	2,990	4,007	429	577
	CBNG	32	22	8	6	152	138	1	0	73	69	79	81	21	22
	Oil	40	21	31	2	276	1	38	0	67	1	12	0	1	0
	H. NG	3	1	1	0	13	0	0	0	7	0	7	0	2	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	336	358	91	96	1,669	1,962	26	4	773	992	3,219	4,436	462	639
	CBNG	80	57	20	15	380	349	2	1	182	174	196	206	51	55
	Oil	46	23	35	2	316	1	44	0	76	1	14	0	2	0
	H. NG	3	3	1	1	15	16	0	0	8	9	8	10	2	3
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	339	357	92	96	1,684	1,952	26	4	781	987	3,255	4,415	467	636
	CBNG	72	50	18	14	339	309	2	1	162	154	174	182	45	48
	Oil	43	22	33	2	295	1	41	0	71	1	13	0	2	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	3	2	1	0	14	3	0	0	8	1	8	0	2	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-18. Pinedale Field Office Total Greenhouse Gas Oil and Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	624,515	831,092	24,216	33,934	6	7	1,134,793	1,546,017	1,075,242	1,466,782
	CBNG	138,573	144,737	7,323	7,896	1	1	292,741	310,961	265,645	282,179
	Oil	15,901	289	619	0	0	0	15,970	291	15,066	262
	H. NG	5,132	6,075	10	13	0	0	5,364	6,362	4,875	5,782
	H. Oil	0	0	0	0	0	0	0	0	0	0
B	NG	611,740	63,102	23,797	1	6	1	1,113,198	63,313	1,054,866	57,275
	CBNG	99,605	104,372	5,258	5,693	1	1	210,282	224,209	190,818	203,457
	Oil	14,714	278	617	0	0	0	14,778	280	13,986	253
	H. NG	196	7,899	0	17	0	0	197	8,272	178	7,518
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	547,316	709,661	21,325	28,982	5	6	996,676	1,320,255	944,487	1,252,597
	CBNG	53,293	54,467	2,817	2,969	0	0	112,592	116,975	102,171	106,148
	Oil	12,691	249	474	0	0	0	12,746	251	12,005	226
	H. NG	4,336	0	9	0	0	0	4,532	0	4,118	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	590,251	785,751	22,941	32,083	5	7	1,073,654	1,461,685	1,017,371	1,386,773
	CBNG	132,125	137,928	6,978	7,525	1	1	279,024	296,330	253,198	268,902

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	Oil	14,519	273	581	0	0	0	14,582	275	13,773	248
	H. NG	4,823	5,744	10	12	0	0	5,041	6,015	4,581	5,467
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	596,556	781,967	23,201	31,932	5	7	1,085,440	1,454,703	1,028,555	1,380,151
	CBNG	117,113	121,916	6,178	6,651	1	1	247,160	261,917	224,283	237,674
	Oil	13,575	261	577	0	0	0	13,633	263	12,911	237
	H. NG	4,652	295	9	0	0	0	4,862	296	4,418	267
	H. Oil	0	0	0	0	0	0	0	0	0	0

Table 4-19. Pinedale Field Office Oil and Gas Criteria Pollutant Emission Reductions from Alternative A (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	12	187	3	55	48	1,535	1	-8	19	896	63	4,623	9	669
	CBNG	23	17	6	5	111	102	1	0	53	51	58	60	15	16
	Oil	3	1	2	0	26	0	3	0	6	0	1	0	0	0
	H. NG	3	-1	1	0	14	-5	0	0	8	-3	9	-3	2	-1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	51	55	14	15	236	303	5	1	104	153	410	685	59	99
	CBNG	51	37	13	10	246	228	1	1	118	114	127	135	33	36
	Oil	10	4	7	0	70	0	10	0	17	0	3	0	0	0
	H. NG	1	2	0	1	3	17	0	0	1	10	1	11	0	3
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	23	21	6	6	105	113	2	0	46	57	181	256	26	37

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	CBNG	3	3	1	1	18	17	0	0	9	9	10	10	3	3
	Oil	4	1	3	0	30	0	4	0	7	0	1	0	0	0
	H. NG	0	0	0	0	1	1	0	0	1	1	1	1	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	20	22	5	6	90	122	2	0	38	62	146	277	21	40
	CBNG	11	10	3	3	59	58	0	0	29	29	32	34	8	9
	Oil	6	3	5	0	51	0	6	0	12	0	2	0	0	0
	H. NG	0	1	0	1	1	15	0	0	1	9	1	10	0	3
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-20. Pinedale Field Office Oil and Gas Greenhouse Gas Emission Reductions from Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	12,774	767,990	418	33,933	0	7	21,595	1,482,704	20,377	1,409,507
	CBNG	38,969	40,366	2,066	2,204	0	0	82,459	86,751	74,827	78,722
	Oil	1,187	10	2	0	0	0	1,192	10	1,080	9
	H. NG	4,936	-1,824	10	-4	0	0	5,167	-1,910	4,697	-1,736
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	77,199	121,431	2,891	4,952	1	1	138,118	225,762	130,755	214,185
	CBNG	85,281	90,270	4,507	4,927	1	1	180,149	193,986	163,474	176,031
	Oil	3,210	40	144	0	0	0	3,224	40	3,061	36
	H. NG	796	6,075	2	13	0	0	832	6,362	756	5,782
	H. Oil	0	0	0	0	0	0	0	0	0	0

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
D	NG	34,264	45,341	1,275	1,851	0	0	61,139	84,332	57,871	80,009
	CBNG	6,449	6,809	345	372	0	0	13,717	14,631	12,447	13,277
	Oil	1,382	16	38	0	0	0	1,388	16	1,293	14
	H. NG	309	331	1	1	0	0	323	347	293	315
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	27,959	49,125	1,015	2,003	0	0	49,353	91,314	46,687	86,631
	CBNG	21,461	22,822	1,146	1,246	0	0	45,580	49,044	41,362	44,504
	Oil	2,326	28	42	0	0	0	2,336	28	2,155	25
	H. NG	480	5,780	1	13	0	0	502	6,066	456	5,515
	H. Oil	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Rawlins Field Office

Table 4-21 and Table 4-22 show the total criteria pollutant and greenhouse gas emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the Rawlins Field Office for each alternative. Table 4-23 and Table 4-24 show the estimated criteria pollutant and greenhouse gas emissions reductions for the Rawlins Field Office compared to Alternative A. The greatest reduction in emissions occurs under Alternative C and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions are also less under all alternatives with Alternative C showing the greatest reduction in emissions.

Table 4-21. Rawlins Field Office Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	151	144	41	39	714	788	11	2	323	398	1,296	1,782	186	257
	CBNG	262	213	69	58	1,365	1,310	7	3	662	655	732	775	192	206
	Oil	34	13	25	1	271	0	36	0	65	1	11	0	1	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	1	1	0	0	6	6	0	0	3	3	3	4	1	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	NG	141	130	38	35	669	715	11	2	303	361	1,220	1,616	175	233
	CBNG	149	121	39	33	776	749	4	2	377	374	416	443	109	118
	Oil	31	12	23	1	252	0	33	0	61	0	11	0	1	0
	H. NG	1	1	0	0	4	7	0	0	2	4	2	4	1	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	83	80	23	22	402	440	6	1	183	223	745	996	107	144
	CBNG	89	71	24	19	463	435	2	1	225	217	248	257	65	68
	Oil	17	7	13	1	138	0	18	0	33	0	6	0	1	0
	H. NG	1	0	0	0	3	0	0	0	2	0	2	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	149	143	40	38	706	781	11	2	320	395	1,287	1,765	184	254
	CBNG	249	201	66	55	1,291	1,238	6	3	626	619	691	732	182	195
	Oil	33	13	24	1	268	0	35	0	64	1	11	0	1	0
	H. NG	1	1	0	0	5	6	0	0	3	3	3	3	1	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	142	74	38	18	675	208	11	5	306	59	1,236	26	177	3
	CBNG	210	166	55	45	1,078	1,026	5	3	522	513	574	606	151	161
	Oil	29	12	22	1	235	0	31	0	56	0	10	0	1	0
	H. NG	1	1	0	0	5	1	0	0	3	0	3	0	1	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-22. Rawlins Field Office Total Oil and Gas Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	241,915	315,607	9,196	12,886	2	3	435,709	587,099	412,639	557,009
	CBNG	492,279	517,863	26,203	28,253	4	5	1,043,882	1,112,604	947,261	1,009,623
	Oil	12,491	156	334	0	0	0	12,545	157	11,682	142
	H. NG	1,744	2,027	3	4	0	0	1,821	2,123	1,655	1,929
	H. Oil	0	0	0	0	0	0	0	0	0	0
B	NG	227,485	286,251	8,663	11,689	2	3	410,041	532,526	388,348	505,235
	CBNG	280,271	296,074	14,914	16,149	2	3	594,232	636,023	539,230	577,153
	Oil	11,600	144	319	0	0	0	11,650	145	10,858	131
	H. NG	1,358	2,526	3	5	0	0	1,417	2,646	1,288	2,405
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	138,264	176,367	5,300	7,203	1	2	249,947	328,113	236,763	311,298
	CBNG	167,179	171,955	8,893	9,374	1	2	354,387	369,293	321,586	335,112
	Oil	6,336	88	168	0	0	0	6,363	88	5,923	80
	H. NG	962	0	2	0	0	0	1,005	0	913	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	239,849	312,686	9,129	12,767	2	3	432,233	581,671	409,361	551,860
	CBNG	465,168	489,191	24,750	26,688	4	4	986,175	1,050,994	894,896	953,715
	Oil	12,351	154	329	0	0	0	12,404	155	11,549	140
	H. NG	1,719	2,008	3	4	0	0	1,795	2,103	1,631	1,912
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	230,086	24,262	8,773	0	2	0	414,965	24,343	393,024	22,022
	CBNG	386,486	405,343	20,539	22,112	3	4	818,866	870,817	743,073	790,215
	Oil	10,818	140	310	0	0	0	10,865	141	10,139	127

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	1,741	98	4	0	0	0	1,822	98	1,656	89
	H. Oil	0	0	0	0	0	0	0	0	0	0

Table 4-23. Rawlins Field Office Oil and Gas Criteria Pollutant Emission Reductions Compared to Alternative A (in tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	10	13	3	4	45	73	1	0	20	37	77	166	11	24
	CBNG	114	92	30	25	589	561	3	1	285	280	315	332	83	88
	Oil	2	1	2	0	19	0	2	0	5	0	1	0	0	0
	H. NG	0	0	0	0	1	-1	0	0	1	-1	1	-1	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	67	64	18	17	313	348	5	1	139	176	551	786	79	113
	CBNG	173	142	46	39	902	875	4	2	438	437	483	518	127	138
	Oil	16	6	12	1	134	0	18	0	32	0	6	0	1	0
	H. NG	1	1	0	0	3	6	0	0	1	3	1	4	0	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	2	1	1	0	8	7	0	0	3	4	10	16	1	2
	CBNG	13	12	4	3	74	72	0	0	36	36	40	43	11	11
	Oil	0	0	0	0	3	0	0	0	1	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	9	70	2	21	39	580	1	-3	16	339	61	1,755	9	254
	CBNG	52	47	14	13	287	284	1	1	140	142	157	168	42	45

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	Oil	4	1	3	0	36	0	5	0	9	0	1	0	0	0
	H. NG	0	0	0	0	1	5	0	0	0	3	0	3	0	1
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-24. Rawlins Field Office Oil and Gas Greenhouse Gas Emission Reductions Compared to Alternative A (in tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	14,430	29,355	533	1,197	0	0	25,668	54,573	24,292	51,774
	CBNG	212,008	221,789	11,289	12,104	2	2	449,650	476,581	408,031	432,470
	Oil	890	12	15	0	0	0	894	12	824	11
	H. NG	386	-499	1	-1	0	0	404	-523	367	-475
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	103,651	139,240	3,896	5,684	1	1	185,761	258,986	175,877	245,711
	CBNG	325,100	345,909	17,310	18,878	3	3	689,494	743,311	625,676	674,511
	Oil	6,155	68	166	0	0	0	6,182	68	5,758	62
	H. NG	782	2,027	2	4	0	0	816	2,123	742	1,929
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	2,067	2,921	67	119	0	0	3,475	5,428	3,278	5,149
	CBNG	27,111	28,672	1,453	1,565	0	0	57,707	61,610	52,366	55,908
	Oil	140	1	5	0	0	0	141	1	132	1
	H. NG	25	19	0	0	0	0	26	20	24	18
	H. Oil	0	0	0	0	0	0	0	0	0	0
	NG	11,829	291,345	423	12,886	0	3	20,744	562,756	19,615	534,988

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
Proposed LUP Amendments	CBNG	105,792	112,520	5,664	6,141	1	1	225,016	241,787	204,189	219,407
	Oil	1,672	16	24	0	0	0	1,680	16	1,543	14
	H. NG	3	1,929	0	4	0	0	-1	2,024	-2	1,841
	H. Oil	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Rock Springs Field Office

Table 4-25 and Table 4-26 show the total criteria pollutant and greenhouse gas emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the Rock Springs Field Office for each alternative. Table 4-27 and Table 4-28 show the estimated criteria pollutant and greenhouse gas emissions reductions for the Rock Springs Field Office compared to Alternative A. The greatest reduction in emissions would occur under Alternative C, and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions are also less under all alternatives with Alternative D showing the greatest reduction in emissions.

Table 4-25. Rock Springs Field Office Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	94	384	25	103	446	2,051	7	6	202	1,025	816	4,529	117	652
	CBNG	2	1	0	0	7	7	0	0	4	3	4	4	1	1
	Oil	21	69	15	24	166	419	22	50	40	100	7	17	1	2
	H. NG	3	15	2	4	24	66	0	0	10	36	9	36	2	9
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	NG	72	297	19	80	345	1,593	5	4	157	797	639	3,521	92	507
	CBNG	1	0	0	0	3	2	0	0	1	1	1	1	0	0
	Oil	16	55	12	19	123	338	16	40	30	81	5	14	1	1
	H. NG	2	12	1	3	17	52	0	0	7	28	6	28	1	7

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	64	259	17	70	311	1,394	5	4	142	698	583	3,090	84	445
	CBNG	1	0	0	0	2	2	0	0	1	1	1	1	0	0
	Oil	13	45	10	15	102	265	14	32	25	63	4	11	0	1
	H. NG	2	2	1	0	16	0	0	0	7	0	6	0	1	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	90	367	24	98	432	1,965	7	5	196	982	794	4,340	114	625
	CBNG	2	1	0	0	7	6	0	0	3	3	4	4	1	1
	Oil	20	66	15	23	160	398	21	48	38	95	7	16	1	2
	H. NG	3	14	2	4	23	63	0	0	10	34	8	35	2	9
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	84	336	23	90	404	1,799	6	5	184	900	747	3,978	107	573
	CBNG	2	1	0	0	7	6	0	0	3	3	3	3	1	1
	Oil	17	57	13	20	134	342	18	41	32	82	6	14	1	1
	H. NG	3	5	2	1	21	8	0	0	9	2	8	1	2	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-26. Rock Springs Field Office Total Oil and Gas Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	151,968	807,068	5,794	32,708	1	7	274,060	1,496,172	259,569	1,419,225
	CBNG	2,495	2,583	131	141	0	0	5,247	5,549	4,761	5,036
	Oil	7,646	19,728	214	1	0	0	7,679	19,814	7,161	17,921

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	5,498	21,342	9	43	0	0	5,694	22,305	5,170	20,269
	H. Oil	0	0	0	0	0	0	0	0	0	0
B	NG	4,541	25,432	1	6	214,324	1,163,009	203,012	1,103,212	4,541	25,432
	CBNG	910	913	46	50	0	0	1,878	1,961	1,704	1,780
	Oil	5,663	15,911	170	1	0	0	5,688	15,980	5,316	14,454
	H. NG	3,727	16,718	5	33	0	0	3,853	17,467	3,497	15,873
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	107,730	550,091	4,145	22,327	1	5	195,078	1,020,491	184,805	968,045
	CBNG	690	675	35	37	0	0	1,425	1,450	1,293	1,316
	Oil	4,705	12,509	133	1	0	0	4,726	12,563	4,408	11,363
	H. NG	3,776	0	6	0	0	0	3,911	0	3,550	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	147,631	773,367	5,638	31,347	1	7	266,445	1,433,812	252,367	1,360,078
	CBNG	2,431	2,516	127	137	0	0	5,111	5,404	4,638	4,904
	Oil	7,347	18,748	207	1	0	0	7,379	18,830	6,882	17,031
	H. NG	5,291	20,456	8	41	0	0	5,481	21,378	4,976	19,428
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	138,650	708,589	5,310	28,737	1	6	250,546	1,314,032	237,324	1,246,474
	CBNG	2,235	2,306	117	126	0	0	4,694	4,954	4,260	4,495
	Oil	6,185	16,132	191	1	0	0	6,212	16,202	5,811	14,654
	H. NG	4,815	920	7	0	0	0	4,986	923	4,526	835
	H. Oil	0	0	0	0	0	0	0	0	0	0

Table 4-27. Rock Springs Field Office Oil and Gas Criteria Pollutant Emission Reductions from Alternative A (in tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	22	86	6	23	101	459	2	1	45	229	177	1,008	25	145
	CBNG	1	1	0	0	4	5	0	0	2	2	2	3	1	1
	Oil	5	14	4	5	43	81	6	10	10	19	2	3	0	0
	H. NG	1	3	0	1	7	14	0	0	3	8	3	8	1	2
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	30	124	8	33	136	657	2	2	60	327	234	1,438	33	207
	CBNG	1	0	0	0	5	0	0	0	2	0	3	0	1	0
	Oil	8	24	6	9	64	154	8	18	15	37	3	6	0	1
	H. NG	1	13	1	4	7	66	0	0	3	36	3	36	1	9
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	3	16	1	4	14	86	0	0	6	43	22	188	3	27
	CBNG	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Oil	1	3	1	1	6	21	1	2	2	5	0	1	0	0
	H. NG	0	1	0	0	1	3	0	0	0	1	0	2	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	10	48	3	13	43	253	1	1	18	126	69	550	10	79
	CBNG	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Oil	4	12	3	4	32	77	4	9	8	18	1	3	0	0
	H. NG	0	10	0	3	3	58	0	0	1	34	1	35	0	9
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-28. Rock Springs Field Office Oil and Gas Greenhouse Gas Emission Reductions from Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	33,343	179,883	1,252	7,275	0	2	59,737	333,163	56,557	316,013
	CBNG	1,586	1,908	85	104	0	0	3,369	4,099	3,057	3,720
	Oil	1,983	3,817	44	0	0	0	1,991	3,833	1,845	3,467
	H. NG	1,771	4,624	3	10	0	0	1,842	4,838	1,673	4,397
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	44,238	256,977	1,649	10,380	0	2	78,983	475,681	74,764	451,180
	CBNG	1,805	67	96	4	0	0	3,821	145	3,468	131
	Oil	2,941	7,219	81	0	0	0	2,954	7,251	2,753	6,558
	H. NG	1,722	21,342	3	43	0	0	1,784	22,305	1,619	20,269
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	4,337	33,701	155	1,360	0	0	7,615	62,360	7,201	59,147
	CBNG	64	277	3	15	0	0	136	596	124	540
	Oil	299	980	8	0	0	0	301	984	280	890
	H. NG	207	886	0	2	0	0	213	926	194	842
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	13,318	98,479	484	3,971	0	1	23,515	182,140	22,244	172,751
	CBNG	261	0	14	0	0	0	552	0	501	0
	Oil	1,461	3,596	23	0	0	0	1,467	3,612	1,350	3,267
	H. NG	682	20,422	1	43	0	0	708	21,381	643	19,434
	H. Oil	0	0	0	0	0	0	0	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Bridger-Teton National Forest

Table 4-29 and Table 4-30 show the total criteria pollutant and greenhouse gas emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the BTNF for each alternative. Table 4-31 and Table 4-32 show the estimated criteria pollutant and greenhouse gas emissions reductions for the BTNF compared to Alternative A. The greatest reduction in emissions would occur under Alternative C and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions would also be less under all alternatives with Alternative C showing the greatest reduction in emissions.

Table 4-29. Bridger-Teton National Forest Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	0	0	0	0	1	1	0	0	0	0	1	2	0	0
	CBNG	4	4	1	1	23	23	0	0	11	11	13	14	3	4
	Oil	6	6	5	1	39	0	6	0	9	0	2	0	0	0
	H. NG	3	4	1	1	15	26	0	0	8	15	9	16	2	4
	H. Oil	0	3	0	0	0	0	0	0	0	0	0	0	0	0
B	NG	0	0	0	0	1	1	0	0	0	0	1	2	0	0
	CBNG	3	3	1	1	18	18	0	0	9	9	10	10	3	3
	Oil	5	4	4	0	25	0	4	0	6	0	1	0	0	0
	H. NG	2	3	1	1	11	18	0	0	6	11	6	11	2	3
	H. Oil	4	3	1	0	18	0	2	0	4	0	1	0	0	0
C	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	1	1	0	0	4	4	0	0	2	2	2	2	1	1
	Oil	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	H. NG	1	0	0	0	5	0	0	0	3	0	3	0	1	0
	H. Oil	1	1	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	0	0	0	0	1	1	0	0	0	0	1	2	0	0
	CBNG	4	4	1	1	24	23	0	0	12	12	13	14	3	4

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	Oil	6	6	5	1	34	0	5	0	8	0	2	0	0	0
	H. NG	0	4	0	1	1	25	0	0	0	15	0	15	0	4
	H. Oil	7	6	3	1	50	0	6	0	12	0	2	0	0	0
Proposed LUP Amendments	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	4	3	1	1	21	21	0	0	10	10	11	12	3	3
	Oil	5	5	4	0	28	0	4	0	7	0	1	0	0	0
	H. NG	3	2	1	0	13	4	0	0	7	1	7	0	2	0
	H. Oil	4	3	1	0	21	0	3	0	5	0	1	0	0	0

Table 4-30. Bridger-Teton National Forest Total Oil and Gas Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	222	271	8	11	0	0	391	505	370	479
	CBNG	8,580	9,077	459	495	0	0	18,249	19,502	16,560	17,697
	Oil	1,788	67	95	0	0	0	1,796	68	1,720	61
	H. NG	5,020	9,142	10	19	0	0	5,248	9,574	4,770	8,702
	H. Oil	6	26	0	0	0	0	6	27	6	24
B	NG	225	271	8	11	0	0	398	505	377	479
	CBNG	6,545	6,953	350	379	0	0	13,918	14,937	12,630	13,554
	Oil	1,132	49	83	0	0	0	1,136	49	1,112	45
	H. NG	3,542	6,542	7	14	0	0	3,703	6,851	3,365	6,227
	H. Oil	892	20	0	0	0	0	896	21	810	18
C	NG	39	43	1	2	0	0	66	80	62	76

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	CBNG	1,487	1,542	80	84	0	0	3,166	3,311	2,873	3,005
	Oil	-10	17	33	0	0	0	-10	17	24	15
	H. NG	1,870	0	4	0	0	0	1,958	0	1,779	0
	H. Oil	20	6	0	0	0	0	20	6	18	6
D	NG	217	270	8	11	0	0	383	502	362	476
	CBNG	8,737	9,219	466	503	0	0	18,556	19,807	16,838	17,974
	Oil	1,565	65	90	0	0	0	1,572	66	1,512	59
	H. NG	127	8,873	0	19	0	0	128	9,292	115	8,446
	H. Oil	2,359	46	0	0	0	0	2,370	47	2,143	42
Proposed LUP Amendments	NG	23	0	0	0	0	0	23	0	21	0
	CBNG	7,677	8,104	411	442	0	0	16,321	17,409	14,811	15,798
	Oil	1,260	57	84	0	0	0	1,266	57	1,230	52
	H. NG	4,330	416	9	0	0	0	4,529	417	4,116	377
	H. Oil	994	24	0	0	0	0	998	24	903	22

Table 4-31. Bridger-Teton National Forest Oil and Gas Criteria Pollutant Emission Reductions from Alternative A (in tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	1	3	0	1	5	19	0	0	3	10	3	11	1	3
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	1	1	0	0	4	7	0	0	2	4	2	4	1	1
	H. Oil	23	1	19	0	139	0	20	0	34	0	6	0	1	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
C	NG	0	0	0	0	1	1	0	0	0	0	1	1	0	0
	CBNG	3	0	1	0	19	0	0	0	9	0	11	0	3	0
	Oil	2	2	1	0	14	0	2	0	3	0	1	0	0	0
	H. NG	2	4	1	1	10	26	0	0	5	15	5	16	1	4
	H. Oil	20	2	18	0	121	0	18	0	30	0	5	0	1	0
D	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	-1	2	0	0	0	1	0	1	0	0
	Oil	5	4	4	0	39	0	5	0	9	0	2	0	0	0
	H. NG	3	0	1	0	14	1	0	0	8	0	9	0	2	0
	H. Oil	22	-2	19	0	139	0	20	0	34	0	6	0	1	0
Proposed LUP Amendments	NG	0	0	0	0	1	1	0	0	0	0	1	2	0	0
	CBNG	0	0	0	0	2	0	0	0	1	0	1	0	0	0
	Oil	1	0	1	0	5	0	1	0	1	0	0	0	0	0
	H. NG	0	2	0	1	2	22	0	0	1	14	1	15	0	4
	H. Oil	16	0	16	0	89	0	14	0	22	0	4	0	1	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-32. Bridger-Teton Field Office Oil and Gas Greenhouse Gas Emission Reductions from Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	-9	-2	0	0	0	0	-16	-3	-15	-3
	CBNG	2,035	7,535	109	411	0	0	4,330	16,191	3,930	14,692
	Oil	6	1	5	0	0	0	6	1	11	1
	H. NG	1,478	2,600	3	5	0	0	1,545	2,722	1,404	2,475

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. Oil	6,381	6	356	0	0	0	6,409	6	6,154	5
C	NG	178	227	7	9	0	0	316	422	299	400
	CBNG	7,093	-142	380	-8	0	0	15,083	-305	13,687	-277
	Oil	663	20	17	0	0	0	666	20	619	18
	H. NG	3,150	9,142	6	19	0	0	3,291	9,574	2,990	8,702
	H. Oil	5,495	20	355	0	0	0	5,519	20	5,349	18
D	NG	0	0	0	0	0	0	-1	0	-1	0
	CBNG	-157	974	-7	53	0	0	-307	2,093	-279	1,899
	Oil	1,804	52	67	0	0	0	1,812	52	1,706	47
	H. NG	4,892	269	10	1	0	0	5,121	282	4,654	256
	H. Oil	6,367	-20	356	0	0	0	6,395	-20	6,141	-18
Proposed LUP Amendments	NG	194	270	8	11	0	0	359	501	341	476
	CBNG	903	0	49	0	0	0	1,927	0	1,749	0
	Oil	229	3	10	0	0	0	230	3	218	3
	H. NG	689	8,726	1	19	0	0	720	9,156	654	8,325
	H. Oil	4,028	2	355	0	0	0	4,046	3	4,016	2

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Thunder Basin National Grassland

Table 4-33 and Table 4-34 show the total criteria pollutant and greenhouse gas emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the TBNG for each alternative. Table 4-35 and Table 4-36 show the estimated criteria pollutant and greenhouse gas emissions reductions for the TBNG compared to Alternative A. The greatest reduction in emissions would occur under Alternative C and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions would also be less under all alternatives, with Alternative C showing the greatest reduction in emissions.

Table 4-33. Thunder Basin National Grassland Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	6	11	2	3	33	61	1	0	15	31	65	137	9	20
	CBNG	4	4	1	1	23	23	0	0	11	11	13	14	3	4
	Oil	6	6	5	1	39	0	6	0	9	0	2	0	0	0
	H. NG	3	4	1	1	15	26	0	0	8	15	9	16	2	4
	H. Oil	0	3	0	0	0	0	0	0	0	0	0	0	0	0
B	NG	5	8	1	2	28	43	0	0	13	22	56	98	8	14
	CBNG	3	3	1	1	18	18	0	0	9	9	10	10	3	3
	Oil	5	4	4	0	25	0	4	0	6	0	1	0	0	0
	H. NG	2	3	1	1	11	18	0	0	6	11	6	11	2	3
	H. Oil	4	3	1	0	18	0	2	0	4	0	1	0	0	0
C	NG	2	3	1	1	12	15	0	0	6	7	26	34	4	5
	CBNG	1	1	0	0	4	4	0	0	2	2	2	2	1	1
	Oil	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	H. NG	1	0	0	0	5	0	0	0	3	0	3	0	1	0
	H. Oil	1	1	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	6	11	2	3	31	59	0	0	15	30	62	133	9	19
	CBNG	4	4	1	1	24	23	0	0	12	12	13	14	3	4
	Oil	6	6	5	1	34	0	5	0	8	0	2	0	0	0
	H. NG	0	4	0	1	1	25	0	0	0	15	0	15	0	4
	H. Oil	7	6	3	1	50	0	6	0	12	0	2	0	0	0
Proposed LUP Amendments	NG	6	10	2	3	29	53	0	0	14	27	59	121	9	17
	CBNG	4	3	1	1	21	21	0	0	10	10	11	12	3	3
	Oil	5	5	4	0	28	0	4	0	7	0	1	0	0	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	3	2	1	0	13	4	0	0	7	1	7	0	2	0
	H. Oil	4	3	1	0	21	0	3	0	5	0	1	0	0	0

Table 4-34. Thunder Basin National Grassland Total Oil and Gas Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	11,833	24,256	464	990	0	0	21,615	45,122	20,487	42,809
	CBNG	8,580	9,077	459	495	0	0	18,249	19,502	16,560	17,697
	Oil	1,788	67	95	0	0	0	1,796	68	1,720	61
	H. NG	5,020	9,142	10	19	0	0	5,248	9,574	4,770	8,702
	H. Oil	6	26	0	0	0	0	6	27	6	24
B	NG	10,172	17,353	403	709	0	0	18,660	32,283	17,690	30,629
	CBNG	6,545	6,953	350	379	0	0	13,918	14,937	12,630	13,554
	Oil	1,132	49	83	0	0	0	1,136	49	1,112	45
	H. NG	3,542	6,542	7	14	0	0	3,703	6,851	3,365	6,227
	H. Oil	892	20	0	0	0	0	896	21	810	18
C	NG	4,573	5,940	186	243	0	0	8,484	11,050	8,048	10,484
	CBNG	1,487	1,542	80	84	0	0	3,166	3,311	2,873	3,005
	Oil	-10	17	33	0	0	0	-10	17	24	15
	H. NG	1,870	0	4	0	0	0	1,958	0	1,779	0
	H. Oil	20	6	0	0	0	0	20	6	18	6
D	NG	11,288	23,542	444	961	0	0	20,650	43,794	19,574	41,550
	CBNG	8,737	9,219	466	503	0	0	18,556	19,807	16,838	17,974

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	Oil	1,565	65	90	0	0	0	1,572	66	1,512	59
	H. NG	127	8,873	0	19	0	0	128	9,292	115	8,446
	H. Oil	2,359	46	0	0	0	0	2,370	47	2,143	42
Proposed LUP Amendments	NG	10,765	21,400	425	874	0	0	19,721	39,811	18,694	37,771
	CBNG	7,677	8,104	411	442	0	0	16,321	17,409	14,811	15,798
	Oil	1,260	57	84	0	0	0	1,266	57	1,230	52
	H. NG	4,330	416	9	0	0	0	4,529	417	4,116	377
	H. Oil	994	24	0	0	0	0	998	24	903	22

Table 4-35. Thunder Basin National Grassland Oil and Gas Criteria Pollutant Emission Reductions from Alternative A (in tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	1	3	0	1	5	17	0	0	2	9	9	39	1	6
	CBNG	1	3	0	1	5	19	0	0	3	10	3	11	1	3
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	1	1	0	0	4	7	0	0	2	4	2	4	1	1
	H. Oil	-3	1	-1	0	-18	0	-2	0	-4	0	-1	0	0	0
C	NG	4	8	1	2	21	46	0	0	10	23	39	103	6	15
	CBNG	3	0	1	0	19	0	0	0	9	0	11	0	3	0
	Oil	2	2	1	0	14	0	2	0	3	0	1	0	0	0
	H. NG	2	4	1	1	10	26	0	0	5	15	5	16	1	4
	H. Oil	-1	2	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	1	3	0	1	5	17	0	0	2	9	9	39	1	6

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	CBNG	0	0	0	0	-1	2	0	0	0	1	0	1	0	0
	Oil	5	4	4	0	39	0	5	0	9	0	2	0	0	0
	H. NG	3	0	1	0	14	1	0	0	8	0	9	0	2	0
	H. Oil	-7	-2	-3	0	-50	0	-6	0	-12	0	-2	0	0	0
Proposed LUP Amendments	NG	1	1	0	0	3	7	0	0	1	4	6	16	1	2
	CBNG	0	0	0	0	2	0	0	0	1	0	1	0	0	0
	Oil	1	0	1	0	5	0	1	0	1	0	0	0	0	0
	H. NG	0	2	0	1	2	22	0	0	1	14	1	15	0	4
	H. Oil	-4	0	-1	0	-21	0	-3	0	-5	0	-1	0	0	0

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Table 4-36. Thunder Basin National Grassland Oil and Gas Greenhouse Gas Emission Reductions from Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	1,661	6,903	61	282	0	0	2,955	12,839	2,797	12,181
	CBNG	2,035	7,535	109	411	0	0	4,330	16,191	3,930	14,692
	Oil	6	1	5	0	0	0	6	1	11	1
	H. NG	1,478	2,600	3	5	0	0	1,545	2,722	1,404	2,475
	H. Oil	-886	6	0	0	0	0	-890	6	-805	5
C	NG	7,261	18,316	279	748	0	0	13,132	34,071	12,439	32,325
	CBNG	7,093	-142	380	-8	0	0	15,083	-305	13,687	-277
	Oil	663	20	17	0	0	0	666	20	619	18
	H. NG	3,150	9,142	6	19	0	0	3,291	9,574	2,990	8,702
	H. Oil	-14	20	0	0	0	0	-14	20	-13	18

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
D	NG	1,661	6,903	61	282	0	0	2,955	12,839	2,797	12,181
	CBNG	-157	974	-7	53	0	0	-307	2,093	-279	1,899
	Oil	1,804	52	67	0	0	0	1,812	52	1,706	47
	H. NG	4,892	269	10	1	0	0	5,121	282	4,654	256
	H. Oil	-2,353	-20	0	0	0	0	-2,363	-20	-2,138	-18
Proposed LUP Amendments	NG	1,069	2,856	39	117	0	0	1,894	5,311	1,793	5,038
	CBNG	903	0	49	0	0	0	1,927	0	1,749	0
	Oil	229	3	10	0	0	0	230	3	218	3
	H. NG	689	8,726	1	19	0	0	720	9,156	654	8,325
	H. Oil	-988	2	0	0	0	0	-992	3	-897	2

*Negative numbers indicate that the selected alterative would produce emissions greater than Alterative A.

Medicine Bow National Forest

Table 4-37 and Table 4-38 show the total criteria pollutant and greenhouse gas emissions from natural gas, CBNG, oil, horizontal natural gas, and horizontal wells in the MBNF for each alternative. Table 4-39 and Table 4-40 show the estimated criteria pollutant and greenhouse gas emissions reductions for the MBNF compared to Alternative A. Since no wells would be installed near the MBNF, there are no emissions to estimate.

Table 4-37. Medicine Bow National Forest Total Oil and Gas Criteria Pollutant Emissions for Each Alternative (tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-38. Medicine Bow National Forest Total Oil and Gas Greenhouse Gas Emissions for Each Alternative (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
A	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
B	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0

Table 4-39. Medicine Bow National Forest Oil and Gas Criteria Pollutant Emission Reductions from Alternative A (in tons per year)

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposed LUP Amendments	NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Alternative	Well Type	PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		HAPs	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
	Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-40. Medicine Bow National Forest Oil and Gas Greenhouse Gas Emission Reductions from Alternative A (tons per year)

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
B	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
C	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
D	NG	0	0	0	0	0	0	0	0	0	0
	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0
	NG	0	0	0	0	0	0	0	0	0	0

Alternative	Well Type	CO_2		CH_4		N_2O		CO_2e		CO_2e (Metric Tonnes)	
Date		2020	2031	2020	2031	2020	2031	2020	2031	2020	2031
Proposed LUP Amendments	CBNG	0	0	0	0	0	0	0	0	0	0
	Oil	0	0	0	0	0	0	0	0	0	0
	H. NG	0	0	0	0	0	0	0	0	0	0
	H. Oil	0	0	0	0	0	0	0	0	0	0

Summary of Oil and Gas Emissions

Oil and gas activities proposed for each field office were evaluated to determine the air quality impacts. The oil and gas activities anticipated under Alternatives B, C, and D, and the Proposed LUP Amendments would reduce the emissions of air pollutants compared to Alternative A. Alternative C would have the largest reduction in criteria air pollutant emissions and Alternative D would have the smallest reduction. Table 4-41 shows the reductions in the number of oil and gas wells from those in Alternative A.

Table 4-41. Total Reductions in Numbers of Oil and Gas Wells from Alternative A

Field Office/Planning Unit	Alternative B	Alternative C	Alternative D	Proposed LUP Amendments
Casper Field Office	513	670	79	275
Kemmerer Field Office	182	367	17	90
Newcastle Field Office	62	160	19	33
Pinedale Field Office	281	815	264	298
Rawlins Field Office	529	1,379	57	280
Rock Springs Field Office	1,091	1,596	203	602
Bridger Teton National Forest	-3	141	0	0
Thunder Basin National Grassland	12	156	3	17
Medicine Bow National Forest	0	0	0	0
Total Wells	**2,667**	**5,284**	**642**	**1,595**

4.2.5 Air Quality Impacts Associated with Non-Oil and Gas Development Activities

The action alternatives have air quality impact consequences for non-oil and gas activities within the planning area. The qualitative impact of each action alternative is discussed in the following sections. The analysis assumes appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

Surface Disturbing Activities

Activities related to surface disturbances (e.g., construction of facilities, roads, and transmission lines) can result in particulate emissions from fugitive dust and/or other criteria pollutant emissions from soil disturbances, construction-related travel, and use of heavy equipment.

A number of the proposed actions within the alternatives address surface disturbances pertaining to sage-grouse core and connectivity habitat areas, nesting/early brood-rearing habitats, winter habitats and winter concentration areas. In addition, some of the action alternatives restrict activities by date, density, and any reclamation activities proposed.

All proposed actions associated with restricting or prohibiting surface disturbing activity for sage-grouse core and connectivity habitat areas, nesting/early brood-rearing habitats, and winter habitats and concentration areas specified by Alternatives B, C, and D, and the Proposed LUP Amendments, could reduce non-oil and gas emissions by limiting travel and activity compared to Alternative A. However, the restrictions on travel could result in creating longer trips by redirecting travel around sensitive areas, and

thereby increasing travel-related emissions. In addition, some of the actions that restrict activities in March through May could redirect emissions toward the other months (such as winter), thereby increasing ozone formation potential. Overall, compared to Alternative A, it is expected that air emissions will be reduced by implementing the actions in Alternatives B, C, and D, and the Proposed LUP Amendments with the greatest emission reduction expected for Alternative C.

Wind Energy Development

Activities related to the construction of wind energy facilities could cause emissions from surface disturbances and equipment usage. In addition, emissions related to travel to the wind sites to operate and maintain the wind systems can occur from fugitive dust and vehicle exhaust from the use of heavy equipment and maintenance vehicles.

The avoidance of wind energy development in core sage-grouse habitat areas could reduce emissions compared to Alternative A. Emissions associated with construction and operations could be reduced for Alternatives C through E. However, the restrictions on travel could result in creating longer trips by redirecting travel for construction machinery and wind farm maintenance operations around sensitive areas, thereby increasing travel-related emissions from engine exhaust and fugitive dust. Overall, compared to Alternative A, it is expected that air emissions will be reduced under Alternatives C-E, with the greatest reduction in emissions anticipated for Alternative C.

Vegetation Treatments

Activities related to vegetation treatments can result in air emissions from equipment and travel. Trucks and heavy equipment (e.g., fire engines and bulldozers) used for vegetation management and manipulation efforts would cause dust from traveling over unpaved roads. Areas receiving vegetation treatment would also contribute to particulate matter (PM) emissions in the short term until the vegetation recovers sufficiently to stabilize exposed soil that is susceptible to wind erosion. Actions regarding vegetation treatments under Alternatives B, C, and D, and the Proposed LUP Amendments would reduce air emissions equally compared to Alternative A.

OHV Restrictions

Activities related to OHV use can result in criteria pollutant emissions of carbon monoxide (CO), NO_x and hydrocarbons from tailpipe exhaust. Use of equipment such as all-terrain vehicles and motorcycles would also cause fugitive particulate emissions from traffic on unpaved roads. The impact from these vehicular emissions is expected to peak during weekends and holidays.

All actions associated with limiting cross-country OHV travel could reduce non-oil and gas emissions by limiting travel compared to Alternative A in the Casper, Rawlins, and Rock Springs field offices. Compared to Alternative A, it is expected that air emissions will be reduced under Alternatives C and D, E, with the greatest emission reduction expected for Alternative C and the smallest reduction expected for Alternative D.

Solid Minerals Exploration, Leasing, and Development

Activities related to mineral leasing and development can result in emissions produced during all phases of solid mineral leasing and development—from exploration, construction, and operational phases of the mining project to well closure, reclamation, and abandonment. Mining activities generate fugitive dust particles and gaseous tailpipe emissions from large mining equipment. Activities such as blasting, excavating, loading and hauling of overburden and mineral resources, wind erosion of disturbed and un-reclaimed mine areas, produce fugitive dust. Crushing, storage, and handling facilities are common stationary point sources for particulate matter. Other air pollutant emissions that could be expected to occur

from solid mineral development are CO, NO_x, particulates (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), etc. All proposed actions associated with restricting leasing for mining of coal, other solid leasable minerals, and mineral materials within sage-grouse key habitat areas under Alternatives B, C, and D, and the Proposed LUP Amendments could reduce non-oil and gas emissions by limiting exploration, construction, and operations associated with mining compared to Alternative A. However, the restrictions on any travel associated with mining could result in creating longer trips by redirecting travel around sensitive areas, and thereby increasing travel-related emissions. Overall, compared to Alternative A, it is expected that air emissions will be reduced under Alternatives B, C, and D and the Proposed LUP Amendments, with the greatest emission reduction expected for Alternative C, and the smallest reduction expected for Alternative D.

Global Climate Change

The assessment of greenhouse gas (GHG) emissions and climate change is still in its formative phase; therefore, it is not yet possible to know with confidence the net impact on climate. However, the Intergovernmental Panel on Climate Change (IPCC 2007) concluded that "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [man-made] greenhouse gas concentrations."

The lack of scientific tools designed to predict climate change at regional or local scales limits the ability to quantify potential future impacts. However, potential impacts on air quality due to climate change are likely to be varied. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased wind-blown dust from drier and less stable soils. Cool season plant species' spatial ranges are predicted to shift north and to higher elevations, and extinction of endemic threatened/endangered plants may be accelerated. Due to loss of habitat or competition from other species whose ranges may shift northward, the population of some animal species may be reduced. Less snow at lower elevations would be likely to impact the timing and quantity of snowmelt, which, in turn, could result in a longer wildfire season.

4.3 CULTURAL RESOURCES

This section presents potential impacts on cultural resources from management actions for sage-grouse habitat, as presented in Chapter 2. Existing conditions concerning cultural and other heritage resources are described in Chapter 3.

The analysis of environmental impacts is based on interdisciplinary team knowledge of resources and the project area, review of existing literature, and information provided by other agencies and institutions. Effects are quantified where possible. In cases where quantitative data are not readily available, best professional judgment or qualitative assessments are used to describe impacts.

4.3.1 Impact Indicators

Indicators of impacts on cultural resources are as follows:

- Changes in acres where surface disturbing activities are restricted or prohibited
- Extent of allowable development (e.g., minerals, ROWs)
- Changes in human presence in areas where cultural resources occur.

4.3.2 Assumptions

The analysis is based on the following assumptions:

- The overall density of cultural properties in the planning area is extremely variable, given the size of the planning area and the diversity of landscapes, vegetation types, distance from water, etc. While some areas are known to have a high density of cultural sites per section, other areas have a very low density, while the density of sites in most of the planning area is unknown due to the lack of inventories. Regardless of site densities at specific portions of the planning area, and given the size and scope of the planning area, it is assumed that cultural resources will continue to be found throughout the planning area as a result of proactive (National Historic Preservation Act Section 110) and required (National Historic Preservation Act Section 106) cultural resource inventories.

- Protection for all cultural resources will occur in accordance with federal laws, BLM regulations, and Forest Service regulations regardless of whether the resources are specifically identified in planning documents.

- Adverse impacts to cultural resources from surface-disturbing activities occur primarily at the time the initial surface disturbance occurs. Therefore, the projected numbers for short-term surface disturbance are used to quantify impacts to cultural resources.

- There is a direct correlation between the number of sites that could be impacted by various actions and the degree, nature, and quantity of surface-disturbing activities allowed within the planning area, coupled with the degree of increased human presence.

- Protection of cultural resources will accord with State Historic Preservation Office (SHPO) coordination requirements; with input from local publics, other interested parties, and Native American groups; and with applicable federal regulations.

- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

The primary impact to cultural resources is the disturbance of artifacts, sites, and features of sites that reduces their scientific integrity, alters their association with traditional values, reduces their public use values, and reduces the potential to provide significant data. This can occur from activities or processes that disturb the surface, remove vegetation, increase soil erosion, or otherwise lead to cultural artifacts being damaged or moved from their original positions (in situ) prior to scientific documentation. Cultural resource information and values can also be damaged or lost if the soil matrix at a site is lost or removed without the potential for scientific study. Although deterioration of cultural sites and their artifacts may be slowed or halted, physical damage to objects and sites cannot typically be reversed. Cultural values can also be affected if the physical setting associated with a site is altered in a way that changes the relationship between the site and its physical surroundings. Short-term impacts on these cultural resource values from visual or auditory disturbance generally affect public or traditional uses of cultural sites or areas. These impacts can diminish the site's traditional use values, but can often be ameliorated or accommodated through activity planning.

4.3.3 Alternative A

Cultural resources could be impacted by the development of transmission lines within new and existing utility corridors, specifically surface disturbances from construction of poles, roads, and ancillary features, and visual impacts to the setting.

Not allowing or avoiding new corridor development in specific areas, such as Bates Hole and Sand Hills Management Area, could help protect cultural resources in these areas by eliminating the potential for surface-disturbing activities and visual impacts caused by the right-of-way (ROW) activities. Under this alternative, excluding 285,930 acres from ROW development would protect cultural resources from potential damage associated with ROW development (Map 2-9). Managing 2,460,340 acres as ROW avoidance areas could also protect cultural resources from potential development. However, ROW exclusion and avoidance areas could also result in longer ROWs (to get around the avoidance/exclusion area). This would result in more surface disturbance and increased potential to impact cultural resources.

Allowing wind energy development within sage-grouse core habitat areas could adversely impact cultural resources in those areas. Managing 424,820 acres as wind energy exclusion areas and 2,438,850 acres as wind energy avoidance areas would help protect cultural resources from surface disturbing activities and associated visual impacts.

Land tenure adjustments could have effects on cultural resources located on the affected parcels. Transfer or disposal of lands from federal ownership could remove cultural properties from BLM and Forest Service jurisdiction and control, and could allow these properties to be impacted by private or state-sponsored activities. Cultural resource inventories and evaluations would be required prior to transferring lands from federal jurisdiction, ensuring that identified sites are adequately documented, evaluated, and mitigated prior to ownership changes. Sites that are not identified prior to transfer from public ownership would be subject to the effects of management by future landowners. Cultural properties on lands transferred to federal ownership would be subject to greater protection from surface-disturbing actions. The BLM and Forest Service could retain or obtain lands containing important cultural and historic resources, providing protection under federal management policies.

Management actions associated with livestock grazing would have both direct and indirect impacts on cultural resources. Implementing healthy rangeland standards and achieving proper functioning condition (PFC) and rangeland health objectives would contribute to improved range conditions, and soil and vegetation stability, thereby protecting cultural resources. However, range improvements that disturb the ground surface could result in impacts on cultural resources. Subsurface prehistoric discoveries that are a result of reservoir, water well, or fence construction would occasionally occur in culturally sensitive

sediments. Data recovery excavations could mitigate the impacts of these discoveries. Livestock grazing could directly impact cultural artifacts and features on or just below the surface by breaking or scattering these artifacts. Alternatively, cattle trails and other heavily trampled and exposed areas could unearth otherwise undetected cultural resources and allow them to be identified and recorded.

Allowing fluid mineral leasing in sage-grouse core habitat areas (Map 2-4) would create surface disturbance that could impact cultural resources in those areas, although the impact would not occur until a fluid mineral project has begun development. Oil and gas leasing would be closed on 871,780 acres; no surface occupancy (NSO) stipulations would be in place on 40,980 acres; and controlled surface use (CSU) on 5,015,210 acres. Based on the RFD scenario, cultural resources could be impacted by the development of 13,653 oil and gas wells and 2,758 CBNG wells. Total surface disturbance for these wells would be 130,330 acres over the short term and 39,050 acres over the long term. Although surface disturbance does not automatically infer damage to cultural resources for all of these areas and acres, it is anticipated that damage would occur on land where cultural resources exist. While damage will occur, it will only happen in the context of mitigation of cultural resources. Mitigated damage, or damage to a site that does not meet the eligibility criteria, such as a non-significant site, is not necessarily considered an adverse effect for the purposes of natural resource's management.

Establishing mitigation measures as a condition of approval for an application for permit to drill (APD), such as offsite placement of facilities, remote control monitoring, restricted or prohibited surface use, including road construction and multiple wells from a single pad, would help to protect cultural resources from surface disturbance. Also, working with project proponents to site their projects in locations that minimize impacts to sensitive resources could protect cultural resources from potential damage.

Areas within the planning area open to mineral materials, locatable and solid leasable minerals development could have an impact on cultural resources in those areas, depending on the extent of development and surface disturbance. Impacts from developing these minerals would be the same as those described for fluid minerals, but would vary somewhat in size and intensity. Areas closed to mineral materials (Map 2-14) at 472,800 acres, locatable minerals (Map 2-19) at 1,892,620 acres and solid leasable minerals (Map 2-24) at 261,000 acres, could protect cultural resources from surface and sub-surface disturbance by not allowing development in these areas.

Allowing dispersed recreation in the planning area would not result in significant impacts on cultural resources. The uninformed and/or willful collection of significant and therefore protected cultural resources could result in damage to or the complete removal of significant cultural resources from the public lands.

Transportation planning that provides access to achieve multiple-use goals, while protecting resources, could impact cultural resources through surface disturbing activities related to the construction of roads that provide access to new mineral, wind or ROW developments for construction and/or maintenance purposes. This would also increase access to areas of public lands. Without sufficient law enforcement associated with recreational activities, actions such as off-road travel, inadvertent vandalism and illegal collection of cultural artifacts could result in a loss of cultural resources and information.

Seasonal stipulations and restrictions on disruptive activities to protect sage-grouse habitat or nesting/early brood-rearing habitat would not provide indirect protection to cultural resources, as the damage to or loss of cultural resources does not differ based on when the surface disturbance occurs. Impacts associated with mineral development and surface disturbance would continue in these areas.

Working with project proponents, partners, and stakeholders to implement direct mitigation actions (e.g., relocation, timing restrictions) would not generally affect the level of impacts from surface disturbing activities on cultural resources, as the surface disturbance will usually still take place in a different location

or season. If direct mitigation actions reduce the amount of anticipated surface disturbance, there would be an associated reduction in the potential to identify new cultural sites (from reduced acreage required for Section 106 inventory), as well as a reduced potential to damage cultural sites, either from excavation (with associated data recovery) or from disturbing cultural sites that were not identified and avoided prior to the surface disturbance.

Because there is little difference between short-term and long-term impacts to cultural resources from surface disturbance, implementing reclamation of surface disturbances in accordance with the Wyoming Reclamation Policy will have no direct impact on cultural resources. Once a disturbance occurs to a cultural resource, the alteration is permanent. However, reclamation actions would decrease impacts from continued soil erosion, which could indirectly protect cultural sites on lands directly adjacent to the initial disturbance. Adjacent sites would have avoided direct impacts from the initial surface disturbance, but could be at risk of indirect impacts from increased erosion from areas lacking vegetation cover and having compacted soils, increasing erosive effects on adjacent lands. Therefore, reclamation of existing disturbance will reduce the potential for indirect impacts from surface disturbances. However, reclamation can damage cultural resources if new disturbance is created by "excessive" reclamation efforts. It should also be noted that successful reclamation can mitigate visual impacts to the setting of cultural resources by returning the disturbance to the natural landscape and vegetation.

Fire management actions would have direct and indirect impacts on cultural resources. Direct damage to cultural resources could occur as a result of the wildland fires and through surface disturbances caused by fire suppression activities such as construction of fire lines, bulldozing access roads, and general movement of heavy equipment. Restrictions on wildland fire and prescribed fire to protect Greater Sage-Grouse habitat would protect historic sites and at the same time result in higher site and artifact visibility. The increased visibility of historic properties would result in vandalism through artifact extraction and collection. The result would be the loss of scientifically important information. Ground disturbing and post-fire rehabilitation activities could also have a direct impact on cultural resources. Fire management actions that minimize the potential for devastating wildland fires would have the added benefit of protecting flammable cultural resources such as historic and prehistoric wooden structures, rock art, and aspen carvings. Fire, either wildland or prescribed, can damage surficial cultural materials such as wood and ceramic artifacts. Surficial lithic materials can also be affected by fire. Fire retardants and other chemicals could affect soil chemistry, which would in turn impact the analysis of subsurface archeological deposits. Rock art, either Native American or Euro-American, could be damaged by smoke and soot, as well as by rock exfoliation or spalling caused by extreme heat.

The use of herbicides for vegetative treatments to improve Greater Sage-Grouse habitats could have an adverse effect on historic properties (BLM 2007d). These impacts may include chemical alteration of cultural artifacts, structures, and features (including rock art), and chemical alteration of the soils associated with these cultural resources. Herbicide treatments may also affect traditional plant gathering practices by Native American Tribes.

4.3.4 Alternative B

Management actions under this alternative that prohibit or restrict surface disturbance within the planning area could protect cultural resources within those areas. Unmitigated surface-disturbing activities could damage or destroy cultural resources that were unknown before that activity. Inventories performed prior to surface disturbance will not always locate all cultural material; therefore, surface disturbances in surveyed areas may still damage undiscovered cultural resources.

Not authorizing new transmission corridors would have the same impact to cultural resources as not allowing new ROW corridors in Alternative A. Managing priority sage-grouse habitat areas as exclusion

areas for new BLM ROW or Forest Service Special Use Authorization (SUA) permits would also have the same impact as managing ROW exclusion areas in Alternative A, however, the number of acres protected would be greatly expanded (Map 2-10). Under this alternative, 5,271,440 acres would be designated as exclusion areas for ROWs while 6,357,180 acres would be designated as avoidance areas for ROWs (Map 2-10). Impacts from managing areas as ROW avoidance would be the same as those described in Alternative A; however, the number of acres would be greatly expanded.

Evaluating and taking advantage of opportunities to bury existing power lines within priority sage-grouse habitat could potentially impact cultural resources through surface and sub-surface disturbance that could damage or destroy these resources. However, burying power lines can help mitigate visual impacts to the setting of cultural resources.

Impacts from excluding 5,033,240 acres in the planning area from wind energy development would be similar to those identified under Alternative A, except the extent of the closed areas is significantly greater than under Alternative A (424,820 acres). This would provide protection to cultural resources from surface disturbing activities associated with wind energy development in a much larger area when compared to Alternative A.

Retaining public ownership of, acquiring, and seeking easements of sage-grouse priority habitat, as opposed to identifying some areas for disposal in Alternative A, could indirectly protect known and unknown cultural resources in these areas. Removing lands from uses that cause surface disturbance, such as retiring livestock allotments, could indirectly protect cultural resources in these areas from further damage. Prohibiting transmission corridors in sage-grouse priority habitat areas would result in no need to perform cultural inventories associated with the development of transmission corridors. That would reduce the potential for identifying new cultural sites, but it would also reduce the potential for incidental damage to cultural sites during the construction of transmission lines within designated corridors.

Identifying areas where acquisitions or conservation easements would benefit sage-grouse would have the same impact on cultural resources as acquisitions in Alternative A.

Closing priority sage-grouse habitat areas to fluid mineral leasing, as opposed to allowing leasing in Alternative A, could protect cultural resources that may be found in those areas from potential surface and sub-surface disturbance (Map-2-5).

Finding all surface mining of coal unsuitable in sage-grouse priority habitat could protect cultural resources from potential surface disturbing activities that would damage or destroy these resources (Map 2-26).

Allowing geophysical exploration within sage-grouse priority habitat could impact cultural resources in these areas through surface and sub-surface disturbing activities associated with geophysical exploration.

Limiting OHV use to designated roads and trails in areas that are currently open to cross-country OHV would decrease impacts compared to Alternative A. Vegetation loss would be eliminated as the areas of existing disturbance continue to be used, with no additional loss from riding on undisturbed areas. Impacts from OHV use to vegetation and soils would be concentrated to areas that have already been disturbed and hardened, reducing the potential to impact cultural resources.

Management actions for wildland fire management would have the same impacts as those in Alternative A.

Developing and implementing sage-grouse monitoring plans would have the same impact as those in Alternative A.

Managing priority sage-grouse habitats so that discrete anthropogenic disturbances cover less than 3% of the total sage-grouse habitat would help to protect cultural resources from the same disturbance in these areas.

Management actions for vegetative treatments using herbicides would have the same impacts as those under Alternative A.

4.3.5 Alternative C

Relocating existing designated ROW corridors crossing sage-grouse priority habitat would have the same impact as described in Alternative B for this same action.

Managing sage-grouse priority and general habitat areas as ROW exclusion areas for new ROW or SUA permits would have the same impact as Alternative B; however, the area of potential impact would be greatly expanded to 11,531,340 acres in Alternative C (Map 2-11).

Excluding wind energy development in sage-grouse priority and general habitat areas would reduce surface disturbance and visual impacts to the setting, potentially protecting cultural resources in those areas. Siting wind energy development at least 5 miles from active sage-grouse leks could also protect cultural resources in those buffer areas.

Avoiding new meteorological (MET) towers within 1 mile of occupied, sagebrush obligate habitats would have the same impacts as those described in Alternative A for the same action.

Prohibiting industrial solar projects in areas of critical environmental concern (ACEC) and occupied sage-grouse habitats could reduce surface disturbance, potentially protecting cultural resources in those areas from damage.

Retaining public ownership of sage-grouse priority habitat would have the same impacts as those described in Alternative B for the same action.

Identifying areas where acquisitions or conservation easements would benefit sage-grouse habitat would have the same impacts as those described in Alternative B.

Acquiring important private lands in BLM-designated ACECs and Forest Service Sage-Grouse Special Areas could help protect these areas from potential surface disturbance that could cause damage to cultural resources.

Prohibiting livestock grazing within sage-grouse priority habitat could protect cultural resources in these areas from damage by livestock trampling.

Closing sage-grouse priority and general habitat areas to fluid mineral leasing would have the same impacts as those described in Alternative B; however, the number of acres closed would be expanded to 16,878,220 acres (Map 2-6), allowing for protection of cultural resources over a much larger area.

Not issuing new geophysical permits within priority and general sage-grouse habitat could reduce potential surface and sub-surface disturbance that would result from these activities. This, in turn, could protect cultural resources from damage within those areas.

Prohibiting construction of evaporation or infiltration reservoirs to hold coalbed methane wastewater could help protect cultural resources from activities that could damage or destroy these resources.

Finding all surface mining of coal unsuitable in sage-grouse priority habitat would have the same impact on cultural resources as Alternative B.

Closing priority habitat to non-energy leasable mineral leasing would have the same impacts as those described in Alternative B for the same action.

Recommending withdrawal from mineral entry in priority habitat would have the same impact on cultural resources as Alternative B (Map 2-21).

Closing sage-grouse priority habitat areas to mineral material exploration would have the same impacts as those described in Alternative B (Map 2-16).

Designating all sage-grouse priority habitat areas and Audubon Important Bird Areas as sage-grouse conservation ACECs and as special interest areas (SIA), as well as designating large ACECs, could indirectly protect cultural resources in these areas that might otherwise be open to surface disturbing activities.

Designating all OHV open areas within sage-grouse core habitat areas as limited to designated roads and trails would have the same impacts as those in Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails would have the same impacts as those described in Alternative B.

Prohibiting new road construction within 4 miles of active sage-grouse leks and avoiding new road construction in sage-grouse priority and general habitat could protect cultural resources from damage that could potentially result from such activities within these buffer areas.

Not allowing new surface occupancy on federal leases within priority habitats would have the same impacts as those in Alternative B for the same action.

Management actions for vegetative treatments using herbicides would have the same impacts as those under Alternative A.

4.3.6 Alternative D

Allowing new transmission projects in existing (and outside existing, if activity does not cause declines in sage-grouse populations) designated utility corridors within sage-grouse core and connectivity habitat areas could impact cultural resources through potential surface disturbance, if developed.

Managing sage-grouse core and connectivity habitat areas as ROW exclusion areas for new ROW or SUA permits would have similar impacts to those described in Alternative A, although the area impacted would vary, based on differences in acres. Under this alternative, 5,230,110 acres would be designated as exclusion areas and 1,300,510 acres would be avoidance areas.

Excluding wind energy development on 424,820 acres in sage-grouse core and connectivity habitat would have the same impact to cultural resources as those described in Alternative A (Map 2-32).

Avoiding new MET towers within 1 mile of occupied, sagebrush obligate habitats would have the same impacts as those described in Alternative A under the same action.

Retaining ownership of sage-grouse core and connectivity habitats, unless other economic or other benefits are determined, would have the same impacts as those in Alternative B.

Acquiring lands based on a variety of economic resources criteria could help to protect cultural resources that might be found in those areas by placing them under federal land management policies and practices.

Impacts to cultural resources associated with Livestock Grazing would be the same as those described in Alternative A.

Impacts to cultural resources from managing fluid mineral leasing and development would be similar to those discussed under Alternative A, except an increase in the areas closed to fluid mineral leasing (964,860 acres; Map 2-7) would reduce the level of related surface disturbance by 6%. This would reduce the potential for damage and degradation of cultural resources caused by surface disturbance related to fluid mineral development.

Solid mineral leasing would be prohibited on 261,000 acres (Map 2-27), which is the same as Alternative A. Impacts from solid mineral leasing would be similar to those described in Alternative A. Considering leasing of non-energy leasable minerals within sage-grouse core and connectivity habitat, except in areas where sensitive resources are located would also have similar impacts to those described in Alternative A.

Withdrawing portions of sage-grouse core and connectivity habitat from mineral entry would have the same impacts as those described in Alternative A for the same action (Map 2-22).

Managing sage-grouse core and connectivity habitat areas as open to mineral material exploration, sales, and free use permits would have the same impacts as those described in Alternative A.

Impacts to cultural resources associated with dispersed recreation would be the same as those described in Alternative A.

Impacts to cultural resources associated with travel management would be the same as those described in Alternative A.

Prohibiting or restricting surface occupancy within a 0.25-mile radius of the perimeter of occupied sage-grouse leks would help to protect cultural resources from surface disturbing activities within these buffer areas.

Management actions for vegetative treatments using herbicides would have the same impacts as those under Alternative A.

4.3.7 Proposed Land Use Plan Amendments

Allowing new transmission projects within the two-mile wide transmission line corridor through Priority Habitat Management Areas (PHMA) would have similar impacts to those described in Alternatives A under the same action. The additional stipulations presented in this alternative would not necessarily reduce the impacts to cultural resources, other than reducing some of the areas where surface disturbance would be allowed from ROW or SUA activities.

Managing General Habitat Management Areas (GHMA) and PHMAs as avoidance areas for new ROW or SUA permits would have similar impacts to cultural resources as those described in Alternative A, except the areas managed as ROW avoidance areas would increase significantly to 6,208,990 acres (Map 2-13).

Excluding wind energy development on 425,080 acres and avoiding such development on the remainder of PHMAs would have impacts similar to those described in Alternative A, except avoidance areas would increase by 2,292,500 acres (Map 2-33) and thereby increase the level of protection to cultural resources.

Retaining public ownership of PHMAs would have the same impacts as those described in Alternative D.

Impacts to cultural resources from livestock grazing on BLM lands would be the same as those described in Alternative A. On National Forest System lands, grazing intensity and duration would be reduced on some allotments, resulting in a potential decrease in impacts to cultural resources compared with Alternative A.

Impacts to cultural resources from managing fluid mineral leasing and development would be similar to those discussed under Alternative A, except an increase in the areas managed with NSO and CSU stipulations (441,690 and 6,438,480 acres, respectively; Map 2-8) would reduce the level of related surface disturbance by 14%. This would reduce the potential for damage and degradation of cultural resources caused by surface disturbance related to fluid mineral development. Impacts from coal surface mining methods would be the same as those described in Alternative D. In general, impacts from solid leasable minerals would be the same as those in A and D, with the same amount of acres closed (Map 2-28). As compared with Alternatives B and C, the Proposed LUP Amendments would protect fewer acres (483,420 acres as opposed to 6,992,690 acres) from surface and sub-surface disturbance that would result from solid leasable mineral development.

Considering and recommending BLM lands for withdrawal from mineral entry, based on risk to the sage-grouse populations in PHMAs, could protect cultural resources from damage that might occur from such development in these areas. National Forest System lands would not be considered for mineral entry withdrawal.

Areas open to mineral material exploration, sales and free use permits (Map 2-18) would have the same impacts as those described in Alternative A and D, with some additional stipulations that could provide additional protection to cultural resources from surface disturbing activities related to mineral material development.

Management of dispersed recreation under this alternative would have the same impacts as those described in Alternative A.

Designating all OHV open areas within PHMAs as limited to existing roads and trails would have the same impacts as those described in Alternatives B and C.

Prohibiting surface occupancy and surface disturbing activities on or within 0.6 miles of occupied sage-grouse leks in PHMAs and within 0.25 miles of occupied sage-grouse leks outside of PHMAs could help protect cultural resources from damage within those buffer areas.

Management actions for vegetative treatments using herbicides would have the same impacts as those under Alternative A.

4.4 FORESTRY

This section presents potential impacts on forestry from implementing management actions presented in Chapter 2. Existing conditions concerning forestry are described in Chapter 3.

4.4.1 Impact Indicators

Indictors of impacts on forestry management are as follows:

- Management actions that prohibit or restrict the use of timber-harvest equipment
- Management actions that affect the maintenance or construction of vehicle routes that are used to access forested areas
- The extent of surface-disturbing activities (and restrictions thereof) that degrade or remove forest cover.

4.4.2 Assumptions

The analysis is based on the following assumptions:

- The long-term sustained yield capacity of the forestlands is based on management restrictions.
- Forest health, forest restoration, and hazardous fuels reduction objectives will be the major determining factors in forest management.
- Clearcut areas, which average between 10 and 25 acres, would be reforested with tree seedlings within 5 to 7 years after harvest. No new permanent roads would be approved for timber harvest unless the roads are also needed for other resource management activities. Temporary roads would be revegetated within 3 to 5 years after closure.
- Minor wood product sales would have no appreciable effect on woodlands because the demand is small compared to the large number of acres.
- Woodland character would be maintained for other uses. Except for aspen, most of the woodland would maintain its present state.
- Greater Sage-Grouse core/priority habitat does not occur in areas of forest products.
- Greater Sage-Grouse do not use forest vegetation for any phase of their life cycle.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.4.3 Alternative A

Under Alternative A, where ROW exclusion or avoidance areas intersect forestry resources, up to 285,930 acres of exclusion areas and 2,460,340 acres of avoidance areas could be protected from vegetation removal or damage from activities associated with ROW development, most of which would be outside areas used for timber harvest. These exclusion and avoidance management actions could displace ROWs to forested areas. If ROWs were developed within forests or woodlands, areas of timber could be temporarily lost

during the development activities and habitat may be altered, preventing new forest growth or the developed area could be maintained for access and the timber resource could be permanently lost.

Oil, gas, and CBNG lease development could disturb up to 130,330 acres over the short-term and 39,050 acres over the long term, most of which would be outside timber harvest areas. If leases were developed within forest or woodland areas, timber could be lost temporarily as a result of surface disturbing activities, but access would be improved in these areas. Disturbed forestry resources could return to pre-disturbance levels within these areas over the long term where reclamation efforts encourage timber growth. Although most of the oil, gas, and CBNG development would take place outside of forest and woodland areas, the Wyoming Range includes areas of high potential for CBNG, and impacts to forestry resources could be increased within those areas if they are developed.

Livestock grazing management could impact forestry resources through response to the evaluation of land health standards and the implementation of grazing management practices designed to protect natural resources. Rangeland management would be evaluated for rangeland health standards within and outside of sage-grouse habitat. This management could impact forestry by improving the productivity and health of woodland and forest habitats. Improvements to the ecological health of vegetation, wildlife habitat improvements, and some rangeland improvement projects could increase the quality of forest products. To meet rangeland standards, appropriate actions would be taken (e.g., season or timing use, numbers of livestock, distribution, intensity of use, kind of livestock, class, and sage-grouse grazing guidance) which could reduce impacts from livestock and maintain or increase vegetation health and timber habitat.

Fuel treatments to reduce the potential fire hazards could reduce the amount of woody material and alter the structure of both the understory and overstory of shrubs/trees, changing the composition of the treated area. Fire management could affect forestry activities by reducing not only fuel loads but also timber products. Fuel treatments would be focused within the wildland urban interface (WUI) areas, in addition to meeting specific non-forestry-related objectives such as fuels reduction and habitat management, some of which could contain forestry/woodland habitat. Using wildland fire to restore forest stands could reduce timber products in the short-term, but overall health and timber production could improve in the long term, as structural diversity would be enhanced.

Impacts from recreation management to forestry management under Alternative A would be minimal. Reducing access to recreation areas within sage-grouse habitat could increase recreational use within forested areas. This could preclude timber harvest, thereby reducing the range of forest management options available to maintain forest health and public safety.

4.4.4 Alternative B

Impacts from ROW management actions would be similar to those discussed under Alternative A, but ROW exclusion and avoidance areas would be increased to 5,271,440 acres and 6,357,180 acres, respectively. This increase in exclusion and avoidance areas could result in increased ROW development and associated vegetation removal and access road construction within forestry areas. Overall reduction in ROW activities could reduce new road construction and could limit access to resources, which could impact timber sales. Reduced road access could also mean more difficult access for wood cutters and others who use forest products. However, if timber resources occurred within the ROW exclusion and avoidance areas, they would be protected from damage or loss from ROW development activities.

Fluid mineral leasing could impact forestry resources less than under Alternative A, due to fewer acres being disturbed by vegetation removal, road construction soil compaction, soil erosion, and plant community health degradation, with 104,050 acres of short-term disturbance and 33,540 acres of long-term disturbance. Impacts on forestry could increase if closing sage-grouse priority habitat to new oil, gas and

CBNG leases would redistribute development into forestry habitat, which could cause an immediate reduction in timber harvest from direct removal of trees and woodlands, as well as a reduction in timber habitat quality due to habitat fragmentation, soil compaction, soil erosion, invasive species establishment and change in the vegetation canopy.

Impacts to forestry management from livestock grazing would be the same as those discussed under Alternative A.

Under this alternative, impacts from recreation management to forestry could increase compared to Alternative A. Recreation could increase in forested areas as restrictions on recreation activities in sage-grouse priority habitat would increase. Increasing recreational use within forested areas could preclude timber harvest and thereby reduce the range of forest management options available to maintain forest health and public safety.

4.4.5 Alternative C

Impacts from ROW management would be similar to Alternative A, but could increase as ROW use could be displaced into forest habitat due to exclusion and avoidance areas expanding. Exclusion areas would increase to 11,556,490 acres.

Fluid mineral leasing could have fewer impacts to forestry resources compared to Alternative A, as less surface area would be disturbed overall for fluid mineral development. Under Alternative C, there would be 85,140 acres of short-term surface disturbance and 27,030 acres of long-term surface disturbance. This could reduce impacts to forestry associated with the removal of forest cover and development of localized barriers or impediments to travel that could limit access to potential harvest areas.

Impacts from livestock grazing would be similar to those discussed under Alternative A, except livestock grazing would be prohibited in sage-grouse priority habitat which could force grazing into forested areas and would reduce the regeneration of aspen and other deciduous trees and shrubs in forested and riparian areas, as grazing impacts would increase in these areas.

Impacts to forestry resources from the use of wildland fire would be the same as Alternative B, but would apply to a larger area.

Impacts to forestry resources from travel management and recreation management would be the same as Alternative B.

4.4.6 Alternative D

Impacts from ROW management would be similar to Alternative A, except ROW exclusion and avoidance areas would increase to 5,230,110 acres and 1,300,510 acres, respectively. This could increase the potential for forest stands to be disturbed as ROW development could be displaced from sage-grouse habitat into forested areas.

Impacts to forestry resources from fluid mineral development overall would be reduced by 6% for short-term surface disturbance (122,910 acres), and reduced 3% for long-term surface disturbance (37,720 acres), compared to Alternative A. There is a potential that fluid mineral development could be displaced into forested areas as many of the restrictions occur in sage-grouse habitat. In areas where fluid mineral development and surface disturbing activities would occur, forest cover could be lost and lease development could limit access to potential harvest areas.

Impacts to forestry resources from livestock grazing and fire management would be the same as those under Alternative A.

Impacts to forestry resources from travel management would be the same as those under Alternative A.

Impacts to forestry resources from recreation management would be the same as those under Alternative A.

4.4.7 Proposed Land Use Plan Amendments

Impacts from ROW management would be similar to Alternative A, except ROW avoidance areas would increase to 6,208,990 acres. This could increase the potential for forest stands to be disturbed as ROW development could be displaced from sage-grouse habitat into forested areas.

Impacts to forestry resources from fluid mineral leasing would be similar to those identified under Alternative A, except greater restrictions to protect sage-grouse habitat (Map 2-8) would reduce surface disturbance associated with fluid mineral development by 14%. This would reduce the potential for degradation and loss of timber resources caused by fluid mineral development activities.

Impacts to forestry resources from livestock grazing on BLM-administered lands would be the same as those described in Alternative A. On National Forest System lands, impacts from livestock grazing would be similar to those discussed under Alternative A, except grazing intensity and duration would be reduced on some allotments, which could decrease the degree of impact on forestry resources compared with Alternative A.

Impacts to forestry resources from wildland fire, travel management, and recreation management would be the same as those discussed under Alternative A.

4.5 LANDS AND REALTY

This section presents potential impacts on lands and realty management from implementing management actions presented in Chapter 2. Existing conditions concerning lands and realty management are described in Chapter 3.

The lands and realty program is a support program rather than an environmental component. The program responds to requests for authorizations, permits, leases, land tenure adjustments, and landownership adjustments from other programs or outside entities. The following discussion of the effects on lands and realty focuses on the constraints and opportunities for ROW authorizations (e.g., pipelines, power lines, transmission lines, roads, and communication sites), land tenure adjustments (disposals and acquisitions), and landownership adjustments (purchases, exchanges, and donations).

The Gateway South, Gateway West and TransWest Express transmission projects are not subject to/exempt from the Proposed LUP Amendments decision to designate PHMA as an avoidance area as detailed in management actions 10, 32, and 127.

The Obama Administration identified these transmission projects as priority projects, as part of the President's commitment to job creation and modernizing America's Infrastructure. These transmission projects were three of seven projects identified for expedited permit review and federal agency coordination among an interagency Rapid Response Team for Transmission (RRTT) established to foster coordination, expedite simultaneous permitting processes, and resolve permitting challenges, while ensuring appropriate environmental reviews.

The BLM is currently processing the applications for Gateway South, Gateway West, and TransWest Express, a high-voltage transmission line, which includes alternatives through this avoidance area/Greater Sage-Grouse habitat. The BLM is analyzing conservation measures for Greater Sage-Grouse as part of the review process for Gateway South, Gateway West, and TransWest Express.

Gateway South, Gateway West and TransWest Express are analyzed in the cumulative impacts section of this plan.

4.5.1 Impact Indicators

Indictors of impacts on lands and realty management are as follows:

- Acres of ROW avoidance and exclusion areas
- Acres in which surface disturbing activities are prohibited or restricted
- Restrictions on land tenure/land ownership adjustments (i.e., areas in which acquisitions, disposals, purchases, or exchanges are prohibited or restricted).

4.5.2 Assumptions

The analysis is based on the following assumptions:

- ROWs for energy-related facilities (e.g., roads, pipelines, transmission lines) are anticipated to increase.

- The installation of power lines, telephone lines, fiber-optic cable, and communication sites is anticipated to increase.
- Existing withdrawals would continue and would be reviewed to determine the need for continuation, modification, revocation or termination.
- The effects of designation and development of transportation and utility ROW corridors would be mitigated on a case-by-case basis.
- The federal agency would continue land tenure adjustments that are in the interest of the public and facilitate resource management objectives.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.5.3 Alternative A

Requiring that utility structures be placed near existing facilities and limiting the designation of new corridors within sage-grouse core habitat areas throughout the planning area (excluding the TBNG and MBNF Planning Units) would serve to consolidate utility ROWs and structures. This would place additional requirements on ROW applicants and would increase management efforts and costs related to proposals submitted by ROW applicants. This impact would be further increased if these restrictions resulted in relocation or redesign of ROW facilities, especially if it resulted in longer linear routes and/or placement of ROWs in areas that are difficult to develop.

Managing 285,930 acres as ROW exclusion areas (Map 2-9) within sage-grouse core habitat areas would preclude ROW development within these areas. This would result in the relocation of proposed ROW facilities outside of these exclusion areas or preclude development of some ROW facilities that could not be effectively located in other areas. Relocation of ROW facilities could also occur within the 2,460,340 acres managed as ROW avoidance areas within sage-grouse general habitat areas (Map 2-9). If avoidance of these areas were not possible, other mitigation measures could be required, such as application of height and other specifications that serve to redesign ROWs to mitigate impacts on sage-grouse. Land-use restrictions that result in the relocation or redesign of proposed ROWs would increase management efforts and costs related to proposals submitted by ROW applicants, which are administered by the lands and realty program. This impact would be further increased if relocation resulted in longer linear routes and/or placement of ROWs in areas that are difficult to develop.

Allowing wind energy development in sage-grouse core habitat areas, except in select areas that are currently unavailable for such development (Map 2-29) would increase the number of ROW applications associated with wind energy development that are processed through the lands and realty program. Managing 424,820 acres as an exclusion area for wind energy development and managing 2,438,850 acres as an avoidance area for wind energy development would reduce the amount of development associated with wind energy development, and thereby the number of ROW applications. The number of applications and extent of related development would be commensurate with the level of anticipated wind energy development. Up to 1,254 wind turbines are projected to be constructed across the planning area through 2020.

Land tenure/landownership adjustments would benefit the overall management of public lands through disposal of isolated parcels and acquisition of parcels that serve to consolidate surface ownership. The ability to sell, exchange or purchase land would allow for the disposal of lands that are difficult to manage and the acquisition of desired land parcels, which would consolidate management and reduce fragmented

surface ownership, thereby improving the overall manageability of public lands within the planning area. Pursuing acquisition of lands in the Bolton Creek Drainage and Bates Creek areas within the Casper Field Office could further increase these effects on public land management, if such acquisitions resulted in exchanges that served to reduce fragmented surface ownership.

Existing and future mineral leasing, exploration, and development would preclude the ability to sell or exchange subsurface public land parcels. The duration of the impact would be directly related to whether the federal leases are held by mineral production and for how long the production continues. The number of ROWs associated with oil and gas development activities is directly related to the oil and gas potential of an area. In areas with high oil and gas potential, there would be a greater number of ROWs because more production facilities would be required to extract the resource.

Allowing oil and gas leasing and development in sage-grouse core, connectivity, and general habitat areas, except in the 871,780 acres that are currently unavailable for leasing (Map 2-4), would increase the number of ROW applications associated with oil and gas development that are processed through the lands and realty program. The number of ROW applications and extent of related development would be commensurate with the level of anticipated oil and gas development. Managing 871,780 acres as unavailable for oil and gas leasing, 40,980 acres as NSO areas, and 5,015,210 acres as CSU areas would reduce the amount of development and therefore the number of ROW applications. Given these restrictions on oil and gas development, a total of 16,411 oil and gas and CBNG wells are projected to be drilled within sage-grouse core, connectivity, and general habitat areas through 2020. This would disturb approximately 39,049 acres over the long term, much of which would be associated with the development of ROW facilities.

Similar to oil and gas development, allowing exploration and development of solid leasable minerals, locatable minerals, and mineral materials would increase the access needs associated with such development. Access needs and the extent of related development would be commensurate with the level of anticipated mineral development. Under this alternative, 261,000 acres would be closed to solid leasable development, 1,892,620 acres would be withdrawn from locatable mineral development, and 472,800 acres would be closed to mineral material sales and permits (Maps 2-24, 2-19, and 2-14), which would reduce the demand for access needs associated with mineral development and thereby decrease the degree of impact.

Prohibiting surface disturbing activities within 0.25 miles of occupied sage-grouse leks within the Pinedale Field Office, Rawlins Field Office, and the Jack Morrow Hills area of the Rock Springs Field Office (68,550 total acres; Map 2-1) and avoiding surface disturbing activities within 0.25 miles of occupied sage-grouse leks within the Casper (and within 4 miles of leks within the Bates Hole and Fish Creek/Willow Creek area), Kemmerer, Newcastle, and Rock Springs field offices (93,580 total acres; Map 2-1) would restrict ROW authorizations in these areas. ROW actions would not be authorized within the 68,550 acres in which surface disturbing activities are prohibited. This would result in the relocation of proposed ROW facilities outside of these restricted areas or, in some cases, could preclude the development of certain ROW facilities. Relocation of ROW facilities could also occur within the 93,580-acre avoidance area. If avoidance of these areas was not possible, other mitigation measures could be required, such as application of height and other specifications that serve to redesign ROWs to mitigate impacts on sage-grouse. Land use restrictions that result in the relocation or redesign of proposed ROWs would increase management efforts and costs related to proposals submitted by ROW applicants, which are administered by the lands and realty program. This impact would be further increased if relocation resulted in longer linear routes and/or placement of ROWs in areas that are difficult to develop.

Avoiding surface disturbing and disruptive activities within sage-grouse nesting/early brood-rearing habitat in the Casper, Kemmerer, Pinedale, and Newcastle field offices from March 15 (March 1 in the Rawlins

and Rock Springs field offices) through July 15 within 2 miles of sage-grouse leks, prohibiting construction activities within 2 miles of sage-grouse active display grounds in the TBNG Planning Unit from March 1 through June 15, and prohibiting construction activities within 2 miles of sage-grouse breeding complexes in the MBNF Planning Unit from March 1 through June 30 would restrict or prohibit ROW authorizations in these areas during these time periods. Such restrictions could result in the relocation or redesign of proposed ROW facilities, but would most likely result in project construction delays in order to meet the requirements of the seasonal restrictions. This would increase management efforts and costs related to proposals submitted by ROW applicants.

Prohibiting surface disturbing and disruptive activities within sage-grouse winter concentration areas within the Casper, Newcastle Pinedale, Rawlins, and Rock Springs (Jack Morrow Hills planning area only) field offices from November 15 through March 14 (and February 1 through July 31 in the Newcastle Field Office) would restrict or prohibit ROW authorizations in these areas during these time periods. Such restrictions could result in the relocation or redesign of proposed ROW facilities, but would most likely result in project construction delays in order to meet the requirements of the seasonal restrictions. This would increase management efforts and costs related to proposals submitted by ROW applicants.

4.5.4 Alternative B

The impacts on lands and realty management resulting from restricting ROWs within sage-grouse priority habitat areas would be similar to those identified in Alternative A, except all sage-grouse priority habitat areas would be managed as exclusion areas for ROWs and SUAs (5,271,440 acres; Map 2-10) and all sage-grouse general habitat areas would be managed as avoidance areas for ROWs and SUAs (6,357,180 acres; Map 2-10). This would increase the acres in which ROWs are precluded or avoided, which would potentially increase the number of ROW facilities that would be located outside of sage-grouse habitat or precluded from development. Existing designated ROW corridors crossing sage-grouse priority habitat that are void of any authorized ROWs would be relocated outside of the priority habitat area. If relocation is not possible, the entire corridor would be undesignated during the planning process.

The impacts on lands and realty management resulting from wind energy development would be similar to those identified in Alternative A, except the projected level of wind energy development would decrease. Excluding wind energy development in sage-grouse priority habitat (5,033,240 acres) would reduce projected development to 127 turbines (Map 2-30), which represents a 90% decrease as compared to Alternative A.

The impacts on lands and realty management resulting from processing land tenure/landownership adjustments would be similar to Alternative A, except the BLM and Forest Service would retain public ownership of sage-grouse priority habitat. This might reduce the ability to dispose of or acquire (through exchange) land parcels in an effort to reduce fragmented surface ownership and improve the manageability of public lands. Exceptions would be considered in cases of where land exchanges would allow for more contiguous federal ownership patterns. In addition, acquiring lands that would enhance management of sage-grouse habitat could result in further consolidation and improved manageability of public lands.

The impacts on lands and realty management resulting from oil and gas exploration and development within sage-grouse priority, connectivity, and general habitat areas would be similar to those identified in Alternative A, except the projected level of well development would decrease. Fewer areas would be available for leasing and development of oil and gas facilities because 6,886,890 acres would be closed to oil and gas leasing, and 2,117,160 acres would be managed as NSO areas (Map 2-5). As a result, 13,709 wells are projected to be drilled within sage-grouse priority, connectivity, and general habitat areas through 2020, which represents a 16% decrease compared to Alternative A.

The impacts on lands and realty management resulting from development of solid leasable minerals, locatable minerals, and mineral materials would be similar to those identified in Alternative A, except the level of development would likely decrease because all sage-grouse priority habitat areas would be closed to such development. Because the number of ROW applications/authorizations and extent of related development would be commensurate with the level of anticipated mineral development, a decrease in ROW applications and authorizations would be realized. Under this alternative, 6,992,690 acres would be closed to solid leasable development and mineral material sales and permits (Maps 2-25 and 2-15), which represents a 1,418% and 1,719% increase, respectively, compared to Alternative A. In addition, 6,879,620 acres would be withdrawn from locatable mineral entry (Map 2-20), which represents a 196% increase, compared to Alternative A.

Managing the level of density of disturbance on the landscape within sage-grouse priority habitats so that discrete anthropogenic disturbances cover less than 3% of the total sage-grouse habitat would limit surface disturbing activities within these areas. Placing a limit on allowable surface disturbance could result in the relocation or redesign of new ROW development projects or, in some cases, preclude such projects to ensure they do not contribute to the exceedance of the density restrictions.

The impacts on lands and realty management resulting from placing restrictions on surface disturbing activities within sage-grouse nesting and early brood-rearing habitat could be reduced compared to Alternative A. Under this alternative, the seasonal restriction on surface disturbing activities within nesting and early brood-rearing habitat would only apply to exploratory drilling and only within sage-grouse priority habitat. This could reduce the level of restrictions on ROW authorizations within sage-grouse nesting and brood-rearing habitats that occur outside of sage-grouse priority habitat areas compared to Alternative A, and thereby result in increased ROW applications and authorizations within these areas.

The impacts on lands and realty management resulting from placing restrictions on surface disturbing activities within sage-grouse winter concentration areas could be reduced compared to Alternative A. Under this alternative, the restriction on surface disturbing activities within winter concentration areas would apply year-round, but would only apply to federal leases and within sage-grouse priority habitat. This could reduce the level of restrictions on ROW authorizations within sage-grouse winter concentration areas that occur outside of sage-grouse priority habitat areas, compared to Alternative A, and thereby result in increased ROW applications and authorizations within these areas.

4.5.5 Alternative C

The impacts on lands and realty management resulting from restricting ROWs within sage-grouse habitat areas would be similar to those identified in Alternative A, except all sage-grouse priority and general habitat areas would be managed as exclusion areas for ROWs and SUAs (11,556,490 acres; Map 2-11) and no areas would be managed as avoidance areas for ROWs and SUAs. This represents the highest level of ROW/SUA restrictions among all the alternatives (3,932% increase compared to Alternative A) and would significantly increase the extent of area in which ROWs/SUAs are precluded, which would reduce the number of ROW applications and increase the number of related facilities that would be relocated outside of sage-grouse priority and general habitat or precluded from development.

The impacts on lands and realty management resulting from wind energy development would be similar to those identified in Alternative A, except the projected level of development would decrease. Because wind energy development would be excluded on 11,531,340 acres (Map 2-31), a total of 127 2-MW wind turbines are projected to be constructed, which represents a 90% decrease compared to Alternative A.

The impacts on lands and realty management resulting from processing land tenure/landownership adjustments would be similar to Alternative A, except the BLM and Forest Service would retain public

ownership of sage-grouse priority habitat. This might reduce the ability to dispose of or acquire (through exchange) land parcels in an effort to reduce fragmented surface ownership and improve the manageability of public lands. However, acquiring lands that would enhance management of sage-grouse habitat could result in further consolidation of public land and improved manageability of public lands.

The impacts on lands and realty management resulting from oil and gas exploration and development within sage-grouse priority, connectivity, and general habitat areas would be similar to those identified in Alternative A, except the projected level of well development would decrease. Fewer areas would be available for leasing and development of oil and gas facilities because 16,878,220 acres would be closed to oil and gas leasing, and 2,117,160 acres would be managed as NSO areas (Map 2-6). As a result, 11,127 wells are projected to be drilled within sage-grouse priority, connectivity, and general habitat areas through 2020 (32% decrease compared to Alternative A). Although this would increase the number of ROW applications associated with oil and gas development, the level of increase would be 32% less than under Alternative A.

The impacts on lands and realty management resulting from development of solid leasable minerals, locatable minerals, and mineral materials would be the same as those identified in Alternative B. Compared to Alternative A, the level of development would likely decrease because all sage-grouse priority habitat areas would be closed to the development of solid leasable minerals, locatable minerals, and mineral materials. Under this alternative, 6,992,690 acres would be closed to solid leasable development and mineral material sales and permits (Maps 2-26 and 2-16), which represents a 1,418% and 1,719% increase, respectively, compared to Alternative A. In addition, 6,879,620 acres would be withdrawn from locatable mineral entry (Map 2-21), which represents a 196% increase, compared to Alternative A.

The impacts on lands and realty management resulting from placing restrictions on surface disturbing activities within sage-grouse nesting and early brood-rearing habitat would likely increase compared to Alternative A. Under Alternative C, the seasonal restriction on surface disturbing activities within nesting and early brood-rearing habitat would prohibit all activities that are disruptive to sage-grouse, whereas such activities are either prohibited or restricted under Alternative A. This would increase the level of restrictions on ROW authorizations within sage-grouse nesting and brood-rearing habitats.

The impacts on lands and realty management resulting from placing restrictions on surface disturbing activities within sage-grouse winter concentration areas would be the same as those identified in Alternative B. Under Alternative C, the restriction on surface disturbing activities within winter concentration areas would apply year-round, but would only apply to federal leases and within sage-grouse priority habitat. This could reduce the level of restrictions on ROW authorizations within sage-grouse winter concentration areas that occur outside of sage-grouse priority habitat areas and thereby further reduce ROW applications and authorizations in these habitats compared to Alternative A.

4.5.6 Alternative D

The impacts on lands and realty management resulting from restricting ROWs within sage-grouse habitat areas would be similar to those identified in Alternative A, except all sage-grouse core and connectivity habitat areas would be managed as exclusion areas for ROWs and SUAs (5,230,110 acres; Map 2-12) and no new acres would be managed as avoidance areas for ROWs and SUAs. This would increase the extent of area in which ROWs/SUAs are precluded, which would potentially increase the number of new ROW or SUA facilities that would be located outside of sage-grouse core and connectivity habitat or precluded from development. General sage-grouse habitat areas would be available for new ROWs or SUAs, subject to BMPs.

The impacts on lands and realty management resulting from wind energy development would be similar to those identified in Alternative A, except the projected level of development would decrease because wind energy development would be excluded on 424,820 acres and avoided within the remaining portions of sage-grouse core and connectivity habitat areas (4,608,420 acres; Map 2-32), unless it can be sufficiently demonstrated that the development activity would not result in declines of sage-grouse core and connectivity habitat populations. This would result in the estimated construction of 980 2-MW wind turbines, which is a 22% decrease compared to Alternative A.

The impacts on lands and realty management resulting from processing land tenure/landownership adjustments would be similar to Alternative A, except the BLM and Forest Service would retain public ownership of sage-grouse core and connectivity habitat unless economic or other benefits are determined. Although this might reduce the ability to dispose of or acquire (through exchange) land parcels in an effort to reduce fragmented surface ownership and improve the manageability of public lands, exceptions would be considered if economic or other benefits are determined.

The impacts on lands and realty management resulting from oil and gas exploration and development within sage-grouse priority, connectivity, and general habitat areas would be similar to those identified in Alternative A, except the projected level of well development would decrease slightly because 964,860 acres would be closed to oil and gas leasing (Map 2-7); therefore, oil and gas leasing and development would be precluded on a greater number of acres than under Alternative A. As a result, 15,769 wells are projected to be drilled within sage-grouse priority, connectivity, and general habitat areas through 2020 (4% decrease compared to Alternative A). Similar to Alternative A, this would increase the number of ROW applications associated with oil and gas development; however, because the number of ROW applications and extent of related development would be commensurate with the level of anticipated well development, the impacts would be less extensive.

The impacts on lands and realty management resulting from the development of solid leasable minerals, locatable minerals, and mineral materials would be the same as those identified in Alternative A.

Managing the existing level of density of disturbance on the landscape to not exceed an average of three energy production locations and/or transmission structures per 640 acres and to not exceed 9% loss of sagebrush habitat within sage-grouse core habitat areas would limit surface disturbing activities within these areas. Placing a limit on the average amount of allowable surface disturbance could result in the relocation or redesign of new ROW development projects or, in some cases, preclude such projects to ensure they do not contribute to the exceedance of the density restrictions. As compared to Alternative B, the density restrictions are less restrictive; therefore, the related impacts to lands and realty management would be less intensive.

The impacts on lands and realty management resulting from placing restrictions on surface disturbing activities would be similar to those identified in Alternative A, except the restricted area would be decreased. Surface disturbing activities and surface occupancy would be prohibited or restricted (depending on the activity and potential effects) within 0.25 miles of occupied sage-grouse leks across the planning area (75,870 total acres; Map 2-2). Compared to Alternative A, in which surface disturbance would be prohibited on 68,548 acres and avoided on 93,580 acres, these actions would allow for greater surface disturbance and therefore fewer restrictions on lands and realty actions.

The impacts on lands and realty management resulting from restricting/prohibiting surface disturbing and disruptive activities within sage-grouse nesting and early brood-rearing habitats would be similar to those identified in Alternative A, except the restriction would be less intensive. Under this alternative, the seasonal restriction on surface disturbing activities within nesting and early brood-rearing habitat would prohibit or restrict (depending on the activity and potential effects) such activities across the planning area

in comparison to Alternative A which strictly prohibits these activities in the TBNG and MBNF Planning Units and avoids these activities in the remaining portions of the planning area. The seasonal restriction would be applied from March 15 through June 30, which is 15-30 fewer days (depending on the Field Office), compared to Alternative A. Although this would affect the ability to develop ROW facilities as described above under Alternative A, the effects would be slightly lessened due to the less intensive restriction and shorter seasonal time frame.

The impacts on lands and realty management resulting from restricting surface disturbing and disruptive activities within sage-grouse winter concentration areas would be similar to those identified in Alternative A, except the restrictions would apply only in sage-grouse core habitat and in areas that support connectivity populations, but would apply across the entire planning area in comparison to only in select field offices under Alternative A. As a result, ROW and SUA proposals would not be authorized within winter concentration areas November 15 through March 14. Such restrictions could result in facility relocation or redesign or, in some cases, could preclude development of proposed ROW and SUA facilities within these areas. Compared to Alternative A, these impacts would likely be more intensive because the restrictions would be applied over a larger extent of the planning area; however, they would be in effect for a shorter period of time (2 fewer weeks).

4.5.7 Proposed Land Use Plan Amendments

The impacts on lands and realty management resulting from restricting ROWs within sage-grouse habitat areas would be similar to those identified in Alternative A, except ROW avoidance areas would increase to 6,208,990 acres (Map 2-13). This would increase the acres in which ROWs are avoided, which would potentially increase the number of ROW facilities that would be located outside of sage-grouse habitat or precluded from development. New transmission projects would be allowed within a designated two-mile wide transmission corridor through PHMAs and within 0.5 miles on either side of existing 115 kV or larger transmission lines. Projects in designated corridors and along these routes will not be counted against the 5% disturbance cap. New transmission projects proposed outside of the corridors specified above would be considered where it can be demonstrated that declines in sage-grouse populations could be avoided through project design and/or mitigation. In addition, new ROWs/SUAs would be co-located within existing ROWs/SUAs where technically feasible and appropriate sage-grouse seasonal timing constraints would be applied, subject to BMPs. This would place further requirements on ROW applicants and could potentially increase processing time and costs. If relocation of corridors resulted in longer linear routes and/or placement of ROWs in areas that are difficult to develop, costs and completion time would likely increase.

The impacts on lands and realty management resulting from wind energy development would be similar to those identified in Alternative A, except the projected level of development would decrease because wind energy development would be excluded on 425,080 acres and avoided within the remaining portions of PHMAs (4,731,350 acres; Map 2-33), unless it can be sufficiently demonstrated that the development activity would not result in declines of PHMA populations. This would result in the estimated construction of 127 2-MW wind turbines (NREL Wind Energy RFD), which is a 90% decrease compared to Alternative A.

The impacts on lands and realty management resulting from processing land tenure/landownership adjustments would be similar as those identified in Alternative B; however, PHMA requirements would be used to prioritize parcels for land tenure adjustments. Non-mineral withdrawals on BLM-administered lands would be evaluated to determine if the action is consistent with sage-grouse conservation within PHMAs. On National Forest System lands, land withdrawals would be recommended as a tool, where appropriate and subject to valid existing rights, to prevent activities that would be detrimental to Greater Sage-Grouse or their habitats.

The impacts on lands and realty management resulting from oil and gas exploration and development within PHMAs and GHMAs would be similar to those identified in Alternative A, except the projected level of well development would decrease. Fewer areas would be available for leasing and development of oil and gas facilities because 883,670 acres would be closed to oil and gas leasing, and 441,690 acres would be managed as NSO areas (Map 2-8). As a result, 14,817 wells are projected to be drilled within PHMAs and GHMAs through 2020. Although this would increase the number of ROW applications associated with oil and gas development, the level of increase would be 10% less than under Alternative A.

The impacts on lands and realty management resulting from development of solid leasable minerals and mineral materials would be the same as those identified in Alternative A, as the areas closed to solid leasable mineral development and mineral material sales and permits would be the same as those identified in Alternative A (Maps 2-28 and 2-18). The impacts on lands and realty management resulting from development of locatable minerals would be similar to those identified in Alternative A, except 121,000 additional acres would be proposed for withdrawal (Maps 2-23).

Managing the level of density of disturbance on the landscape to not exceed an average of one energy or mining facility per 640 acres and 5% disturbance within PHMAs (core only) would limit surface disturbing activities within these areas similar to Alternative B. Placing a limit on the average amount of allowable surface disturbance could result in the relocation or redesign of new ROW development projects or, in some cases, preclude such projects to ensure they do not contribute to the exceedance of the density restrictions. However, because the density restrictions are less restrictive than those under Alternative B, which has a 3% disturbance cap, the related impacts to lands and realty management would be less intensive.

The impacts on lands and realty management resulting from placing restrictions on surface disturbing activities would be similar to Alternative A, except the restricted area would be increased. Surface disturbing activities and surface occupancy would be prohibited within 0.6 miles of occupied sage-grouse leks inside PHMAs and within 0.25 miles of occupied sage-grouse leks outside PHMAs (337,860 acres; Map 2-3). Surface disturbing activities and surface occupancy also would be restricted on 160,630 acres (Map 2-3). This could result in the relocation or redesign of proposed ROW facilities or, in some cases, could preclude the development of certain ROW facilities. Compared to Alternative A, in which surface disturbance and surface occupancy would be prohibited on 68,550 acres, these actions would increase the total number of acres on which ROW development activities are prohibited and thereby increase the impact on lands and realty management (e.g., management efforts and costs).

The impacts on lands and realty management resulting from restricting/prohibiting surface disturbing and disruptive activities within sage-grouse nesting and early brood-rearing habitat would be similar to those identified in Alternative A, except the restriction would be more intensive. Under this alternative, the seasonal restriction (March 15-June 30 [15 fewer days]) on surface disturbing activities within breeding, nesting and early brood-rearing habitat would prohibit such activities throughout PHMAs (core only), within 2 miles of active leks in GHMAs, and within 4 miles of active leks in PHMAs (connectivity only). Similar to Alternative A, such restrictions could result in the relocation or redesign of proposed ROW facilities, but would most likely result in project construction delays in order to meet the requirements of the seasonal restrictions. This would increase management efforts and costs related to proposals submitted by ROW applicants, which are administered by the lands and realty program. However, because the restrictions are more intensive and would be applied to a larger area, the impacts would be greater compared to Alternative A.

The impacts on lands and realty management resulting from restricting surface disturbing and disruptive activities within sage-grouse winter concentration areas would be similar to those identified in Alternative A, except the restrictions would apply only in PHMAs (core only) and over a shorter time period (December 1 through March 14 [15 fewer days]), but would apply across the entire planning area (versus

only in select field offices). As a result, ROW proposals would not be authorized within winter concentration areas during this time period. Such restrictions could result in facility relocation or redesign or, in some cases, could preclude development of proposed ROW facilities within these areas. Compared to Alternative A, these impacts would likely be more intensive because the restrictions would be applied over a larger extent of the planning area.

4.6 LANDS WITH WILDERNESS CHARACTERISTICS

This section identifies potential impacts to land with wilderness characteristics from implementing actions presented in Chapter 2. Existing conditions of lands with wilderness characteristics are described in Chapter 3.

4.6.1 Impact Indicators

Indicators of impacts on lands with wilderness characteristics are as follows:

- The amount and type of access to lands with wilderness characteristics
- The amount of land use conflicts
- The amount of surface disturbing and disruptive activities occurring within or near lands with wilderness characteristics
- The ambient noise level within or near lands with wilderness characteristics.

4.6.2 Assumptions

The analysis is based on the following assumptions:

- The BLM would continue to manage natural areas to protect their wilderness characteristics.
- Management to protect sage-grouse under the various alternatives could provide additional protections for natural areas.
- It is unlikely that implementation of the management actions for sage-grouse will impair the size, naturalness, solitude, or primitive recreation opportunities within inventoried lands with wilderness characteristics. A site specific NEPA analysis will be conducted for implementation actions and the inventory units will be re-evaluated.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.6.3 Alternative A

Wilderness characteristics are primarily influenced by actions that impact the undeveloped nature of the area, or by activities that increase the presence of other visitors.

Surface disturbing activities and disruptive activities occurring within lands with wilderness characteristics would increase the potential for impacts on these lands. Examples of these activities include increased human presence, use of heavy equipment, development, and facilities associated with development such as compressors, power lines, pipelines, and generators. These impacts include degradation of undisturbed natural places and would likely be short-term in duration because mitigation measures would be applied that would designed to remove evidence of development.

Prohibiting surface disturbing activities on 68,550 acres and restricting surface disturbance on 93,580 acres (Map 2-1) would reduce the occurrence of surface disturbance within lands with wilderness characteristics from new permitted activities. This would provide additional protections for lands with wilderness

characteristics by preserving the natural settings that provide opportunities for solitude and primitive recreation, thus improving the quality and experience of the visitor.

Seasonal timing limitations on occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas and seasonal restrictions on disruptive activities would reduce the level of development and human visitation on lands with wilderness characteristics areas during the time periods listed in Chapter 2. However, any exception to seasonal restrictions could potentially result in indirect impacts to lands with wilderness characteristics by allowing surface disturbing and disruptive activities to proceed.

Managing ROW exclusion (285,930 acres) and avoidance areas (2,460,340 acres) (Map 2-9) within core and general habitat and limiting ROWs and transmission projects to designated corridors in some areas would serve to consolidate utility ROWs and structures. This would reduce the overall potential of surface disturbance in these areas and the associated impacts to lands with wilderness characteristics. However, if no alternative location is available and utility structures were placed within sage-grouse core habitat, potential impacts to lands with wilderness characteristics could occur. The likelihood of such impacts would be minimal because of site specific environmental analysis for each proposed ROW and mitigation measures that would be applied to prevent or limit impacts. Impacts from the development of any ROW granted would be short-term in duration and would primarily occur from surface disturbance during the construction phase and any associated maintenance. Lands with wilderness characteristics would be affected by above and below ground ROW infrastructure projects. Such impacts could be reduced and localized through measures to consolidate ROW corridors and through exclusion and avoidance.

Pursuing land acquisitions would increase the acreage of federal lands. New land acquisitions could be added for the purpose of protecting lands with wilderness characteristics.

Oil and gas leasing would be allowed in portions of core and general sage-grouse habitat (Map 2-4) with 13,653 oil and gas wells and 2,758 CBNG wells projected during the planning period. This would cause an estimated 130,330 acres of short-term surface disturbance and 39,050 acres of long-term disturbance. This could also increase the potential for impacts to lands with wilderness characteristics, including impacts such as increased human presence and the use the heavy equipment in areas that could otherwise provide solitude and wilderness-like recreation opportunities. Exceptions to lease stipulations in regards to the NSO or CSU restrictions considered on a case-by-case basis could also result in increased surface disturbing activities and human presence in these areas. However, most impacts from exceptions may only change the timing of when impacts occur because most lease exceptions only modify the timing limitation stipulations. Additionally, reclamation efforts of surface disturbing activities in sage-grouse habitats and efforts to work with proponents to identify appropriate site locations would minimize impacts to lands with wilderness characteristics and provide additional protections to the values and uses of these areas.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would help to maintain the condition of lands with wilderness characteristics by improving the overall health and function of vegetation in previously disturbed areas. This would also indirectly assist in providing protections to preserving the naturalness and limited access of these areas.

Minimizing noise levels by applying BMPs to noise generating activities, such as oil and gas development and production, and implementing other noise reducing stipulations would impact lands with wilderness characteristics by restricting noise levels caused by development and facilities. These practices would assist in maintaining the natural primitive and semi-primitive conditions and settings and the experiences of solitude that such areas provide.

Allowing wind energy development in sage-grouse core and general habitat areas, except in areas that are currently unavailable for such development (Map 2-29), would increase the potential for impacts to lands with wilderness characteristics where such activities are allowed. Through the year 2020, an estimated 1,254 wind turbines will be constructed in the planning area. It is uncertain how many, if any, wind turbines could be constructed in or within sight of areas with wilderness characteristics, but the presence of these tall structures could decrease wilderness values and impact the settings of naturalness and solitude that contribute to wilderness characteristics.

Determining core habitat areas to be unsuitable for coal leasing, closing these areas to non-energy mineral leasing (Map 2-24), withdrawing the lands from locatable mineral entry (Map 2-19), and closing lands to mineral material exploration, sales and free use permits (Map 2-14) could result in decreased development in lands with wilderness characteristics. These types of mineral development activities can reduce the naturalness and solitude of wilderness settings; thus these closures and withdrawals could help preserve primitive recreation settings, roadless areas, and solitude in areas that have wilderness characteristics.

4.6.4 Alternative B

Designating all priority habitat areas as a sage-grouse conservation ACEC could help preserve wilderness characteristics where these areas overlap. Approximately 5,000,400 acres would be designated as special designations/management areas (SD/MA) under this alternative, which would be a significant increase over Alternative A. Any overlap between these special areas and lands with wilderness characteristics could help maintain wilderness settings and values in those areas.

Not allowing new surface occupancy within priority habitat, including winter concentration areas, would have similar impacts as prohibiting or restricting surface disturbance under Alternative A, except four-mile buffers with a cap on surface disturbance of one disturbance per section, and no more than 3% total surface disturbance, would protect more total area from surface disturbance, which would reduce the impacts to lands with wilderness characteristics from surface disturbance described above.

NSO restrictions on existing leases within priority habitat would reduce the total amount of surface disturbance allowed in these areas compared to the density limitations discussed under Alternative A. Placing a limit on the average amount of allowable surface disturbance could result in the relocation or redesign of new development projects or, in some cases, preclude such projects to ensure they do not contribute to the exceedance of the density restrictions. The overall extent of surface disturbances would be reduced, compared to Alternative A, which would provide additional protection to lands with wilderness characteristics. This would assist in reducing impacts that could occur to the naturalness and solitude of wilderness settings. In addition, this could indirectly provide assistance in maintaining primitive and semi-primitive recreational opportunities on lands with wilderness characteristics.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would have similar impacts as under Alternative A, except to a greater extent due to increased areas where surface disturbance is seasonally limited and surface disturbing activities are prohibited.

Expanding ROW exclusion areas to include all priority sage-grouse habitat (5,271,440 acres), expanding ROW avoidance areas to all general habitat (6,357,180 acres), and limiting ROWs and transmission projects to designated corridors throughout the planning area (Map 2-10) would reduce the impacts discussed under Alternative A because less area would be available for ROWs and new corridors would be prevented, which could otherwise cross or run adjacent to lands with wilderness characteristics.

Effects from pursuing land acquisitions would have a similar impact to lands with wilderness characteristics as under Alternative A, except that more acquisitions would be pursued.

Approximately 6,886,890 acres would be closed to oil and gas leasing, and 2,117,160 acres would be managed with NSO stipulations. This would reduce the short-term surface disturbance by 20% from Alternative A to 104,050 acres and reduce the long-term disturbance by 14% to 33,530 acres. Overall, 11,555 oil and gas wells (15% fewer than Alternative A) and 2,154 CBNG wells (22% fewer than Alternative A) are projected over the life of the plan under Alternative B. This would reduce the overall impacts discussed under Alternative A by decreasing the level of human presence and the use of heavy equipment in these areas and by reducing the potential for impacts to natural and primitive settings on lands with wilderness characteristics.

Not allowing exceptions to lease stipulations, COAs, and T&Cs in priority habitat would restrict and, in some cases, preclude development related to oil and gas. In turn, this would reduce surface disturbance within lands with wilderness characteristics, indirectly providing additional protections to natural settings and primitive or unconfined recreational uses in these areas.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to lands with wilderness characteristics as Alternative A.

Limiting noise to 10 dBA at active lek perimeters would be similar to impacts identified under Alternative A. This would result in additional protections to primitive to semi-primitive recreational settings within lands with wilderness characteristics.

Wind energy development as discussed under Alternative A would be excluded within sage-grouse priority habitat (Map 2-30). As a result, the number of wind turbines would be reduced from 1,254 under Alternative A to 127 (a 90% reduction). The removal and reduction of potential wind energy development would be significantly less that those identified in Alternative A. This would indirectly provide additional protections to lands with wilderness characteristics where wind development might be allowed.

Determining core habitat areas to be unsuitable for coal leasing, closing these areas to non-energy mineral leasing (Map 2-24), withdrawing the lands from locatable mineral entry (Map 2-19), and closing lands to mineral material exploration, sales and free use permits (Map 2-14) would reduce the occurrence of these types of mineral development compared with Alternative A, which would prevent impacts from related surface disturbance on lands with wilderness characteristics.

4.6.5 Alternative C

The effects of designating ACECs and SIAs would have the same impact to lands with wilderness characteristics as under Alternative B, except Audubon Important Bird Areas would also be designated. This could further increase areas for which wilderness characteristics could be protected if such areas overlap. Approximately 6,423,374 acres would be managed as SD/MAs under this alternative, which represents an increase of 1,397,821 acres compared to Alternative B, some of which could overlap lands with wilderness characteristics and contribute to the protection of wilderness values in those areas.

Not allowing new surface occupancy within priority habitat, including winter concentration areas (timing and distance stipulations) would be the same as under Alternative B.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would have the same impact to lands with wilderness characteristics as Alternative B, except that requirements would be extended to disruptive

activities as well, which could reduce noise, traffic, and human presence. This would be an indirect benefit to wilderness values such as solitude and primitive recreational experiences.

Expanding ROW exclusion areas to include all priority and general sage-grouse habitat (11,556,490 acres, expanded from Alternative B) (Map 2-11) and limiting ROWs and transmission projects to designated corridors (same as Alternative B) would reduce the impacts from ROWs discussed under Alternative A, more than under Alternative B.

Effects from pursuing land acquisitions would have the same impact to lands with wilderness characteristics as Alternative B.

Oil and gas leasing would not be open on any areas within priority and general sage-grouse habitat under Alternative C (Map 2-6). This would remove impacts discussed under Alternative A for all oil and gas development, except for that associated with valid existing leases. This would reduce the short-term surface disturbance by 35% from Alternative A to 85,140 acres, and reduce the long-term disturbance by 31% to 27,030 acres. Overall, 9,533 oil and gas wells (30% fewer than Alternative A) and 1,594 CBNG wells (42% fewer than Alternative A) are projected over the life of the plan under Alternative C. Lease buy-outs in priority and general habitat would prevent development of some oil and gas leases, which could indirectly prevent more of the impacts discussed under Alternative A.

Not allowing exceptions to lease stipulations, COAs, and T&Cs in both priority and general habitat would expand the protection of lands with wilderness characteristics from mineral development to these areas. This would increase the areas protected over both Alternatives A and B.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to lands with wilderness characteristics as Alternative A.

Impacts from minimizing noise levels would have the same impact to lands with wilderness characteristics as Alternative B.

Siting wind turbines at least five miles from active leks could reduce impacts to lands with wilderness characteristics from wind turbines in some areas, but could increase them in areas where there are no active leks (Map 2-31). The number of wind turbines would be reduced from 1,254, under Alternative A, to 127 (a 90% reduction, and the same as Alternative B). The removal and reduction of potential wind energy would decrease visual, noise, and traffic impacts to primitive and semi-primitive recreation opportunities discussed under Alternative A. These actions would indirectly provide additional protections to the natural settings of lands with wilderness characteristics by reducing the potential of surface disturbing activities.

Prohibiting industrial solar projects in ACECs and occupied habitat would reduce potential renewable energy development in those areas. This could indirectly help protect lands with wilderness characteristics if these areas overlap.

Impacts from coal leasing, non-energy leasable minerals (Map 2-25), locatable mineral entry (Map 2-20), and mineral material exploration, sales, and free use permits (Map 2-15) would have the same impact to lands with wilderness characteristics as under Alternative B.

4.6.6 Alternative D

Not designating sage-grouse conservation ACEC/SIAs would have the same impact as Alternative A.

Impacts from restricting surface disturbance (Map 2-2) would have similar impacts as described in Alternative A, except 75,870 acres would be restricted and none would be prohibited. This could allow for

impacts to lands with wilderness characteristics to occur in some areas otherwise protected under Alternative A, but areas within sage-grouse core and connectivity habitat would be more protected from activities that would degrade wilderness settings and values.

Density limitations of 3 locations per 640 acres and a 9% disturbance cap within core habitat would limit noise, visual impacts, user conflict, and traffic congestion impacts from development activities, but less so than NSO restrictions under Alternatives B and C.

Seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A in some areas and remove them in others. The overall impact of seasonal restrictions would be similar to those impacts discussed under Alternative A.

Managing core and connectivity habitat areas as ROW exclusion areas (5,230,110 acres) (Map 2-12), with 1,300,510 acres as avoidance outside core and connectivity areas would increase the effects described under Alternative A. Inside core and connectivity areas, impacts to lands with wilderness characteristics would be the same as Alternatives B and C. In general habitat areas, impacts to lands with wilderness characteristics would be the same as Alternative A. The management of ROW corridors would have the same impact to lands with wilderness characteristics as Alternative A.

Effects from pursuing land acquisitions would have the same impact to lands with wilderness characteristics as Alternative A.

Areas closed to oil and gas leasing would be expanded to include Raven Creek in the Newcastle Field Office and three areas in the Pinedale Field Office, which would increase the total area to 964,860 acres (Map 2-7). This would reduce impacts from minerals management on lands with wilderness characteristics from Alternative A, but not by nearly as much as Alternatives B and C. Estimated short-term surface disturbance would be reduced by 6% from Alternative A to 122,910 acres, and long-term disturbance would be reduced by about 3% to 37,720 acres. Overall, 13,083 oil and gas wells (only 4% fewer than Alternative A) and 2,686 CBNG wells (only 3% fewer than Alternative A) are projected over the life of the plan under Alternative D.

Impacts from exceptions to lease stipulations, COAs, and T&Cs would have the same impact to lands with wilderness characteristics as under Alternative A.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to lands with wilderness characteristics as Alternative A.

Impacts from minimizing noise levels would have the same impact to lands with wilderness characteristics as Alternative A.

Excluding wind energy development on 424,820 acres and avoiding wind energy development within the remaining portions of sage-grouse core and connectivity habitat areas (4,608,420 acres; Map 2-32), unless it can be shown that sage-grouse populations would not decline, would reduce the total number of wind turbines in the planning area to 980 (a 22% reduction from Alternative A). This would reduce the amount of surface disturbance and would provide indirect protections to lands with wilderness characteristics and natural settings and values.

Impacts from coal leasing would be of the same type as described under Alternative A, but on less area. Coal leasing would occur on more area than Alternatives B and C, thus the impacts on lands with wilderness characteristics would be greater than those alternatives. Non-energy leasable minerals (Map 2-26) would

be allowed on approximately the same area as Alternative A, but with more mitigation aimed at protecting sagebrush habitat, which would reduce impacts to lands with wilderness characteristics as well. Locatable mineral entry (Map 2-21), mineral material exploration, sales, and free use permits (Map 2-16) would have the same impact to lands with wilderness characteristics as under Alternative A.

4.6.7 Proposed Land Use Plan Amendments

The effects of designating SD/MAs would have the same impact to lands with wilderness characteristics as under Alternative D.

Prohibiting surface disturbing activities on 337,860 acres (Map 2-3) would result in the same impacts as described in Alternative A, except 269,310 more acres would be prohibited. Restricting surface disturbance on 160,630 acres (Map 2-3) would have the same impact as described in Alternative A, except impacts would occur on 67,050 additional acres.

Density limitations of 1 oil and gas or mining location per 640 acres and a 5% disturbance cap within PHMAs (core only) would have impacts similar to those described under Alternative D, but to a larger area. Less surface disturbance would be allowed, which would protect natural settings and values within lands with wilderness characteristics.

Seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A. Timing and distance impacts would be greater than Alternative D, but less than Alternatives B and C.

The management of ROW exclusion areas (285,930 acres) and avoidance areas (6,208,990 acres) (Map 2-13) within PHMAs and GHMAs would be similar to those discussed under Alternative A, except avoidance areas would be expanded by 3,748,650 acres. This would increase the amount of area in which ROWs would be restricted and possibly precluded, which would reduce related effects on lands with wilderness characteristics. The management of ROW corridors would have the same impact to lands with wilderness characteristics as Alternative A.

Effects from pursuing land acquisitions would have the same impact to lands with wilderness characteristics as Alternative A.

Approximately 883,670 acres would be closed to oil and gas leasing (Map 2-8), which is about the same as under Alternative A (871,780 acres closed to oil and gas leasing). Although areas closed to oil and gas leasing would be approximately the same, other restrictions such as NSO and CSU would be greatly increased to 441,690 and 6,438,480 acres, respectively, which would further protect natural settings and values within lands with wilderness characteristics. Estimated short-term surface disturbance would be reduced by 14% from Alternative A to 112,327 acres, and long-term disturbance would be reduced by about 9% to 35,432 acres. Overall, 12,355 oil and gas wells (10% fewer than Alternative A) and 2,462 CBNG wells (11% fewer than Alternative A) are projected over the life of the plan under the Proposed LUP Amendments. This would mean more protection than Alternatives A and D, but less than Alternatives B and C.

Impacts from exceptions to lease stipulations, COAs, and T&Cs would have the same impact to lands with wilderness characteristics as under Alternative A.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to lands with wilderness characteristics as Alternative A.

The impacts on lands with wilderness characteristics resulting from minimizing noise levels near sage-grouse leks would be similar to those described under Alternative A, except the level of protection would increase. Limiting noise levels at the perimeter of sage-grouse leks to not exceed 10 dBA above ambient noise would further assist in maintaining the natural primitive and semi-primitive conditions of lands with wilderness characteristics.

Excluding wind energy development on 425,080 acres and avoiding wind energy development within the remaining portions of PHMAs (4,731,350 acres; Map 2-33), unless it can be shown that sage-grouse populations would not decline, would reduce the total number of wind turbines in the planning area to 127 (a 90% reduction from Alternative A). This would reduce the amount of surface disturbance and would provide indirect protections to lands with wilderness characteristics and natural settings and values.

Impacts from coal leasing and non-energy leasable minerals would have the same impact to lands with wilderness characteristics as Alternative D. Pursuing withdrawals from locatable mineral entry and requiring stipulations for mineral material exploration, sales, and free use permits would reduce impacts to lands with wilderness characteristics, compared to and as described under Alternative A. However, an additional 121,000 acres would be withdrawn from mineral entry, which would further help to protect wilderness character.

4.7 LIVESTOCK GRAZING

This section presents potential impacts on livestock grazing management from implementing management actions presented in Chapter 2. Existing conditions concerning livestock grazing are described in Chapter 3.

4.7.1 Impact Indicators

Indicators of impacts on livestock grazing are as follows:

- Management actions that prohibit or limit the construction or maintenance of structural and non-structural range improvements
- Management actions that result in the modification or removal of structural range improvements
- Management actions that close areas to livestock grazing
- Management actions that change the timing, duration, or frequency of permitted use, including temporary closures
- Management actions that lead to a change in oil and gas development activities, coal and other solid leasable mineral development, and locatable mineral entry in areas open to livestock grazing
- Management actions that change the quantity of vegetation production, the structure of the overall plant community, or the forage conditions in areas open to livestock grazing.

4.7.2 Assumptions

The analysis is based on the following assumptions:

- Livestock grazing would be managed to meet the Wyoming Standards for Rangeland Health on BLM-administered lands (BLM 1997a).
- The type of grazing use would remain about the same.
- Range improvement projects would continue to be used to achieve rangeland management goals.
- Range improvements would include the following types of projects: spring/seep development and protection, reservoirs and pits, wells, new or modified fencing, vegetation treatments, and pipelines.
- Livestock grazing is not considered a surface-disturbing activity.
- Restrictions on the construction of range improvements for the protection of sage-grouse habitats.
- Impacts on livestock grazing activities are generally the result of activities that affect forage levels and of human disturbance/harassment of livestock within grazing allotments.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.7.3 Alternative A

Surface disturbing activities involve land clearing, grading, and construction of roads, well pads, and other facilities that can result in soil disturbance, removal of vegetative cover, and an increase in the potential for the introduction and proliferation of noxious weeds, thereby causing a loss of livestock forage from direct removal of vegetation, and from degradation of vegetation communities that reduce forage production (even if the area is still vegetated).

Surface disturbance and disruptive activity restrictions apply to activities related to oil and gas activities on new leases (including development of associated infrastructure), development associated with linear and non-linear ROWs (some of which are related to oil and gas and wind energy development, and some of which are not), wind energy development, development of other leasable minerals and mineral materials, some range improvement projects, and disruptive activities that require a Special Recreation Use Permit.

Requiring that utility structures be placed near existing facilities and limiting the designation of new transmission corridors within sage-grouse core habitat areas (excluding the Newcastle Field Office) may result in reduced surface disturbance loss. However, development out of core and into other habitats might increase the impacts there, including loss of vegetation and forage resources, and an increase in the potential for the introduction and proliferation of noxious weeds. However, these restrictions would concentrate the locations of surface disturbance within designated ROWs in the long-term, which would decrease widespread forage loss. Additionally, livestock grazing management should benefit in several ways. First, surface disturbance is not spread out over a large area but instead is consolidated, which should reduce forage removal by surface disturbance. Second, if surface disturbance is consolidated, patterns of livestock movement will not be as disrupted. Third, it is less likely that existing range improvement projects will be removed or damaged.

Under Alternative A, 285,930 acres of sage-grouse core habitat areas would be managed as ROW exclusion areas (Map 2-9), which would prevent surface disturbing activities related to ROW development from occurring within the exclusion area and would prevent forage loss from ROW development in these areas. General sage-grouse habitat would be managed as a ROW avoidance area (2,460,340 acres; Map 2-9), which would reduce surface disturbing activities related to ROW development from occurring within the avoidance areas and would reduce forage loss from ROW development in these areas.

Allowing wind energy development activities in sage-grouse core habitat areas, except in areas that would be closed in order to protect sensitive resources, would increase vegetation removal and forage loss. All sage-grouse core habitat areas would be available for wind energy development activities, except for 424,820 acres within specific areas that would be excluded for the protection of sensitive resources (Map 2-29). Approximately 1,254 2-MW wind turbines are projected to be constructed across the entire planning area. Wind energy development activities involve land-clearing and surface disturbances. These actions would remove and disturb vegetation and result in a short-term loss of forage resources, as well as an increase in the potential for the introduction and proliferation of noxious weeds and subsequent decline in the health of vegetative communities, until these areas are stabilized and revegetated. Within the areas closed to wind energy development, the amount of land-clearing and surface disturbance associated with the development of new wind turbines would be eliminated, which would in turn reduce the amount of soil disturbance, vegetation disturbance, and subsequent forage loss. Land-clearing to construct new MET towers would be avoided within one mile of sage-grouse habitat (2,438,850 total acres avoided), which would reduce surface disturbing activities and subsequent forage loss within these areas.

Adjustments to livestock grazing management would impact livestock grazing permittees/lessees on allotments managed by the BLM not meeting the Wyoming Standards for Rangeland Health due to existing livestock grazing management. Such adjustments could include season-of-use changes, changes in stocking

rates, implementation of improved grazing management practices (e.g., growing season deferment, riparian pastures, and exclosures), forage utilization limits, and conversions in kind or type of livestock. Such management changes could result in increased operating costs to the livestock operator. There are 186 out of 574 BLM allotments within core habitat not meeting the current RMP standards due to livestock grazing.

Adjusting grazing practices during times of drought would occur across the National Forest and BLM Field Offices. Although these actions would help to enhance rangeland conditions and increase long-term forage production, animal unit months (AUMs) use could also decrease for some operators.

Structural range improvements (including but not limited to: cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks, windmills, etc.) would potentially alter grazing management practices and increase surface disturbing activities in the short-term. However, the distribution of livestock, ability to manage livestock, and achievement of long-term livestock and resource management goals would generally improve. Construction of range improvements would serve to alter livestock distribution and allow livestock to utilize a greater area of the rangeland, and allow livestock use to be more evenly distributed across the rangeland. Such improvements could potentially occur across portions of the planning area. Prohibiting the placement of salt, mineral, or forage supplements for livestock within 500 feet in the Rock Springs Field Office (and within 0.25 miles in the Casper, Kemmerer, Pinedale field offices and MBNF) to 0.25 miles in the TBNG, from streams, creeks, wetlands, and riparian areas would draw livestock away from sensitive riparian areas and result in maintaining or improving riparian conditions and water quality. This would enhance forage conditions and stabilize water sources for livestock. Appropriate site placement of range improvement projects can improve the achievement of long-term livestock resource and management goals in some areas.

Projects designed to improve watershed conditions would enhance vegetation resources by reducing erosion and improving water quality, thereby increasing forage levels for livestock. However, in some cases adjustments in livestock management may be needed to meet or maintain riparian habitat requirements, PFC, and water quality objectives. These adjustments could include grazing deferments, season-long rest, exclosures, livestock conversions, and fencing of riparian areas, or other adjustments determined appropriate for the specific area in question. These activities would reduce management flexibility and increase costs in areas where streams are not properly functioning or where water quality objectives are not being met until these goals are obtained. The potential long-term effect of meeting these goals would be an increase or maintenance of forage and water availability.

Allowing fluid mineral leasing in sage-grouse core habitat areas throughout the planning area, except in unavailable areas (Map 2-4), would result in increased forage loss and decreased vegetative health. Under Alternative A, 871,780 acres would be closed to oil and gas leasing, 40,980 acres would be managed as NSO areas, and 5,015,210 acres would be managed as CSU areas. Under this alternative, 13,653 oil and gas wells and 2,758 CBNG wells would be anticipated in sage-grouse core habitat, resulting in 130,332 acres that would be disturbed over the short-term (before reclamation), and 39,049 acres that would be disturbed over the long-term (after reclamation). Oil and gas development activities would involve land-clearing and surface disturbances, such as the construction of well pads, roads, and pipelines in sage-grouse core habitat areas. These actions remove and disturb vegetation and increase the potential for the introduction and proliferation of noxious weeds, subsequently decreasing the overall health of available forage both in the short term during construction activities and in the long term as permanent structures (e.g., well pads, pits, and roads) are maintained. In addition, fluid mineral development activities could increase the potential for livestock harassment and loss from vehicle collisions; however, the improvement of roads associated with oil and gas leasing activities could also facilitate livestock management operations by improving access to remote locations within allotments. Not applying minimum lease sizes within sage-grouse core habitat areas under this alternative may result in a greater number of smaller leases, thus causing increased surface disturbances, vegetation removal, and subsequent forage loss.

Withdrawing areas from locatable mineral entry (1,892,620 acres; Map 2-19) would decrease the amount of surface disturbing activities associated with mineral entry, thereby helping to maintain vegetation for livestock grazing.

Allowing non-energy, solid leasable mineral leasing within sage-grouse core habitat areas, except in areas that are closed to such activities (261,000 acres), would result in land-clearing and surface disturbances from mineral extraction and excavation, associated road construction, and construction of surface mining facilities, which remove and disturb vegetation and result in subsequent short-term and long-term loss of forage available for grazing. The magnitude of long-term vegetation removal and reduction in available forage from mining activities and mineral exploration would depend on the duration of activity, as well as the type of reclamation efforts implemented and how long it would take for disturbed areas to become stabilized and vegetated.

Mineral material exploration, sales, and free use permit operations in sage-grouse core habitat areas (except areas that are unavailable) would also lead to surface disturbances that would result in short-term and long-term loss of forage (Map 2-14). Under Alternative A, 472,800 acres of sage-grouse habitat areas would be closed to mineral material exploration, sales, and free use permits, and salable mineral pits no longer in use would continue to be available for other resources.

Managing the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area within the Kemmerer, Rawlins, and Rock Springs Field Offices, respectively, as OHV "open" areas would result in short-term and long-term impacts to vegetation and forage conditions. A one-time disturbance resulting from OHV use could cause physical damage to vegetation by breaking stems and branches. Usually, with a one-time disturbance, plants and disturbed areas would recover. However, with repeated use, soil compaction occurs and new trails would be established, resulting in long-term loss of vegetation and forage available for grazing. Under Alternative A, motorized travel would be limited to existing roads, primitive roads, and trails until such travel management planning is complete. Because recreational OHV users would remain on designated roads, vegetation would reestablish in the formerly open areas, and forage availability for livestock grazing would increase.

Prohibiting surface disturbing activities (which could include the construction of new roads) within 0.25 miles of occupied sage-grouse leks within the Pinedale Field Office, Rawlins Field Office, and the Jack Morrow Hills planning area within the Rock Springs Field Office (68,550 acres) and restricting surface disturbing activities within 0.25 miles of occupied sage-grouse leks in the Casper, Kemmerer, Newcastle, and Rock Springs field offices (93,580 acres) would reduce the amount of surface disturbing activities resulting from newly permitted activities, such as blading and grading, and therefore reduce the amount of vegetation removal and forage loss. However, these avoidances may result in increased road construction outside of the avoided areas, as longer roads may be constructed to circumvent the lek buffers, which could cause increased surface disturbance and subsequent vegetation removal and loss of forage in these areas.

Vegetation management actions designed to enhance vegetation production, age class, structural diversity, and plant community vigor would benefit livestock grazing by increasing forage availability and improving livestock distribution and animal performance. Vegetation management could also result in short-term grazing management adjustments to the season and duration of use, affecting the operators' overall grazing operation. Applying vegetation treatment measures in the TBNG where shrub canopy cover of sagebrush is less than 15%, and in areas less than 80 acres and no more than 20% of the sagebrush stands in wintering habitat for TBNG, could result in short-term vegetation loss and subsequent grazing impacts during treatment activities, but would improve vegetation health and available forage for livestock over the long-term. Additionally, vegetation treatment areas within the Pinedale and Rock Springs/Green River Field Offices would be rested from livestock grazing for a minimum of two full growing season after treatment, and one full year prior to treatment in the Rock Springs Field Office, which would result in short-term

limitations in livestock management options and temporary reductions of livestock grazing in treated areas. However, vegetation community and production recovery in treated areas would be enhanced as a result of vegetative treatments, increasing the post-treatment grazing capacity of treated lands in the long-term.

Wildland fire would have varying effects on livestock grazing depending on fire size and intensity, the time of year the fire occurs, and fuel moisture content. Wildland fire would initially displace livestock, and depending on the proximity of livestock to the wildland fire, livestock could be stressed, injured, or killed. Wildland fire would remove vegetation and decrease forage levels over the short term. However, over the long term, fire would generally improve forage production, especially when effective post-fire management efforts are implemented. Wildland fire could also damage livestock improvements, such as fences and corrals, which would necessitate short-term management changes. Under Alternative A, after firefighter safety, prioritization of suppression would be considered for multiple resources. This would result in little change in forage availability in the short term; while in the long term, forage would decrease the most due to an overall increase in later seral stage sagebrush communities, with resulting decreases in herbaceous species used for forage. Prescribed fire would be used in areas having greater than 10-inch precipitation zones to reduce shrub cover and increase the herbaceous forage available for grazing animals. Over the long-term, this action would increase management flexibility and improve grazing distribution. For a period of time after a fire, enhanced forage availability and production would be realized as herbaceous vegetation would temporarily replace woody shrub species.

While livestock grazing is not considered a surface disturbing activity in itself, management actions to limit surface disturbing activities inside and outside sage-grouse core habitat and connectivity areas would maintain the health and function of vegetative communities, and subsequently maintain forage availability for livestock. Prohibiting surface occupancy and disturbance within 0.25 miles of occupied sage-grouse leks within the Pinedale Field Office, Rawlins Field Office, and the Jack Morrow Hills planning area within the Rock Springs Field Office (68,550 acres), and restricting surface disturbing activities within 0.25 miles of occupied sage-grouse leks within the Casper, Kemmerer, Newcastle, and Rock Springs field offices (93,580 acres) would reduce the amount of surface disturbing activities resulting from newly permitted activities. A reduction in surface occupancy and disturbances would decrease the amount of vegetation removal and potential for noxious weed proliferation in these areas, and subsequently maintain the health and function of vegetation in both the short-term and long-term.

Prohibiting the construction of new oil and gas facilities is prohibited within 0.25 miles of active sage-grouse display grounds at any time on the TBNG. There is a timing restriction for both the TBNG (from March 1 through June 15) and the MBNF (from March 1 through June 30), and permitting short-term disturbances to improve habitat within two miles of sage-grouse breeding habitat within both the TBNG and MBNF would decrease the amount of surface disturbance occurring.

4.7.4 Alternative B

No new transmission corridors or above-ground transmission structures would be authorized within sage-grouse priority and connectivity habitat areas, both inside and outside existing corridors. Prohibiting new transmission corridors and transmission structures would prevent associated surface disturbances from taking place. This would benefit livestock grazing within sage-grouse priority habitat areas, as surface disturbances, and resulting forage loss, from utility corridor development would not occur.

Under Alternative B, 5,271,440 acres of priority sage-grouse habitat would be managed as ROW exclusion areas compared to 285,930 acres excluded in Alternative A. This would increase the area in which ROWs would be prohibited, which would result in less surface disturbance in these areas and therefore help to maintain forage levels. General sage-grouse habitat areas would be managed as avoidance areas for new ROWs, 6,357,180 acres, except for areas currently managed as ROW exclusion areas, thus restricting the

amount of surface disturbing activities and resulting forage loss from occurring compared to Alternative A in which 2,460,340 acres would be avoided. Where existing leases or ROWs have had some level of development and are no longer in use, the site would be reclaimed. Restoring the habitat would provide additional forage for livestock over the long-term compared to Alternative A.

Wind energy development activities would be excluded within sage-grouse priority habitat (5,033,240 acres). This would result in less development inside sage-grouse priority habitat areas, which would decrease surface disturbance in the short-term and long-term, relative to Alternative A. These restrictions would reduce the amount of vegetation removal and forage loss associated with wind energy development activities, compared to Alternative A in which only 424,820 acres are closed to development. Approximately 127 2-MW wind turbines are projected to be constructed across the entire planning area, which would be 90% fewer turbines than under Alternative A. MET towers would be prohibited in sage-grouse priority habitat areas, therefore surface disturbing activities associated with MET towers would not occur under this alternative, compared to MET tower disturbances in Alternative A.

Allotments managed by the BLM within sage-grouse priority habitat not meeting the Wyoming Standards for Rangeland Health due, in part, to existing livestock grazing, would require a 20-30% forage allocation reduction for livestock on these allotments under this alternative compared to Alternative A. Within priority habitat there are 574 total allotments. Of those, 186 are not meeting standards and would be subject to these forage allocation reductions. Retiring specific allotments and/or permits could occur under this alternative, thus reducing the number of acres available for livestock grazing. Refer to the socioeconomic analysis in section 4.11 for a discussion of impacts from retirement of grazing allotments.

Preparing drought contingency plans will benefit livestock grazing management by helping grazing permittees/lessees plan for drought, determine management options during drought, and support sustainable forage production and grazing operations. Post-drought management has the potential to negatively impact livestock grazing and management in priority sage-grouse habitat areas in the short-term due to possible changes in management and AUMs. Post-drought management might be a negative impact in the short-term, but would be positive in the long-term as plant communities are able to better recover from drought, maintaining their stability and flexibility.

Impacts associated with new structural range improvements, such as cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks, windmills, etc., would be the same as those described in Alternative A, except in priority habitat they would be evaluated to make sure they conserve, enhance, or restore sage-grouse habitat.

Under this alternative, limiting additional water developments to those that would conserve, enhance, or restore sage-grouse habitats could reduce the flexibility to manage livestock and address distribution problems in some grazing allotments. Limiting new water developments would result in fewer isolated livestock concentration areas, but would also limit management flexibility. Priority sage-grouse habitat areas would be closed to oil and gas leasing, unless there is an opportunity for the BLM and Forest Service to influence conservation measures where surface and/or mineral ownership is not entirely federally owned (Map 2-5). Under Alternative B, 6,886,890 acres would be closed to oil and gas leasing and 2,117,160 acres would be managed as NSO areas. Under this alternative, 11,555 BLM/Forest Service oil and gas wells and 2,154 CBNG wells would be anticipated in sage-grouse priority habitat areas, resulting in 104,050 acres that would experience short-term disturbance, and 33,534 acres that would be disturbed over the long term. The number of wells anticipated would be 16% less than under Alternative A. This would reduce the amount of vegetation removal and loss of available forage for livestock grazing, compared to Alternative A. Not applying minimum lease sizes within sage-grouse priority habitat areas would have the same impacts to livestock grazing as under Alternative A. Under Alternative B, oil and gas leasing would be prohibited within priority habitat (with the exception that if the lease is entirely within priority habitat, a four-mile

NSO would be applied around the lek), which would maintain vegetation for livestock grazing because no new vegetative disturbances would occur as a result of oil and gas development on new leases.

Withdrawing areas from locatable mineral entry (6,879,620 acres) based on risk to sage-grouse and its habitat from conflicting locatable mineral potential and development would result in impacts to livestock grazing similar to Alternative A, except those impacts would occur over a much larger area (Map 2-20).

Vegetation removal and loss of forage availability from non-energy solid leasable mineral development would be reduced, relative to Alternative A. In this area 6,992,690 acres would be closed to solid mineral development compared to 234,230 acres closed in Alternative A. New coal leases and coal exploration licenses within sage-grouse priority habitat areas would be prohibited, and additional screening processes would be implemented outside sage-grouse priority habitat areas. No new leases for other solid leasable minerals or mineral exploration by prospecting permits or licenses would be allowed inside sage-grouse priority habitat areas, and mineral material exploration, sales, and free use permits would also be closed in sage-grouse priority habitat areas, subject to valid existing rights. A reduction in these operations would reduce the amount of associated surface disturbance, and subsequently reduce the amount of vegetation removal and loss of forage availability.

All sage-grouse priority habitat areas (6,992,690 acres) would be closed to mineral material exploration, sales, and free use permits, compared to 472,800 acres closed in Alternative A (Map 2-15). Reclamation of mineral pits no longer in use would return the grazing lands to the production levels found prior to development.

Managing the OHV use in the Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area as “open” would result in surface disturbance and forage loss similar to Alternative A, except the non-sand dune portions of these areas would be managed as “limited to designated roads and trails”. Because recreational OHV users would remain on designated roads within these areas, vegetation would reestablish in the formerly open areas and forage availability for livestock grazing would increase in the long term. Impacts due to collisions or disturbance from the presence of OHV users would be the same as Alternative A.

Prohibiting new road construction within all priority sage-grouse habitat (5,000,400 acres), unless valid existing rights cannot be accessed via existing roads, would further reduce the amount of surface disturbing activities associated with road development compared to Alternative A, in which surface disturbing activities are prohibited within 68,550 acres and restricted within 437,680 acres. The restoration of roads and trails would include reseeding and transplanting sagebrush, which over the long-term could increase available forage for livestock grazing.

Impacts to livestock grazing from not reducing sagebrush shrub canopy cover to less than 15% and resting all vegetation treatment areas for two full growing seasons, except for the offices that don’t rest vegetation treatments (the only offices that rest are the ones mentioned in Alternative A), would be similar to Alternative A, except they would occur within all priority sage-grouse habitat, thereby increasing the extent of the impacts. Under this alternative, prioritization of suppression in sage-grouse priority habitat would result in little change in forage availability in the short term, while in the long term, forage would decrease due to an overall increase in later seral stage sagebrush communities, with resulting decreases in herbaceous species used for forage.

The long-term enhancements in forage availability and production produced by wildland fire would have similar impacts to livestock grazing as Alternative A, but would be realized over more acres. Post fuels management projects would be designed to ensure long term persistence of seeded or pre-treatment native plants which could cause temporary or long-term changes in livestock grazing management. Prescribed fire

would be used in areas having greater (>12 inch) precipitation zones compared to Alternative A in which a 10-inch or greater precipitation zone is required.

Managing the existing levels of density of disturbance on the landscape within sage-grouse priority habitat and connectivity habitat areas would increase protection to forage levels within these areas over the long-term. Density of disturbance on the landscape would not cover more than 3% of the total sage-grouse priority habitat regardless of ownership (and would not exceed 3% habitat disturbance per 640 acres inside sage-grouse connectivity areas). In priority habitat where the 3% disturbance threshold is already realized, no further disturbances would be permitted and an additional designation would ensure that no more than 3% of the total priority habitat is disturbed within 10 years. These limits would reduce vegetation disturbance and removal, and subsequently maintain the overall health and function of forage available for livestock grazing, compared to Alternative A in which surface occupancy and disturbance activities would be prohibited on 68,550 acres and restricted on 437,680 acres, with no threshold values.

4.7.5 Alternative C

Under Alternative C, 11,556,490 acres of priority and general sage-grouse habitat areas would be managed as ROW exclusion areas which would provide 95% of additional forage areas for livestock compared to Alternative A. Site reclamation to restore the habitat would be the same as the impacts described in Alternative B.

Wind energy development activities would be excluded within sage-grouse priority and general habitat areas (11,531,340 acres). This would result in less development inside sage-grouse priority habitat areas, which would decrease surface disturbance in the short-term and long-term, relative to Alternative A in which only 424,820 acres are closed from development. Approximately 127 wind turbines are projected to be constructed across the entire planning area, which would be 90% fewer turbines than under Alternative A. However, impacts to livestock grazing from the construction of new MET towers would be the same as those described in Alternative A. These restrictions would reduce the amount of vegetation removal and forage loss associated with wind energy development activities, compared to Alternative A.

Under Alternative C, livestock grazing would be entirely prohibited within sage-grouse priority habitat. A total of 574 grazing allotments are located entirely within sage-grouse priority habitat, and 1,125 allotments are located partially within sage-grouse priority habitat. These allotments/partial allotments represent 560,180 permitted AUMs (approximately 30% of the total permitted AUMs), which would become unavailable for use by livestock as a result of the closure to livestock grazing within sage-grouse priority habitat.

Additional measures to ensure that soil cover and native herbaceous plants are at their ESD/LRMP vegetative potential to help protect against invasive plants, would improve vegetative resources for livestock grazing under this alternative. These impacts would not be realized under any of the other alternatives. Retiring specific allotments and/or permits could occur under this alternative, thus reducing the number of acres available for livestock grazing compared to Alternative A.

Post-drought management would ensure vegetation recovery occurs in all priority and general sage-grouse habitat areas, which could further reduce AUM use compared to Alternative A. Preparing drought contingency plans will benefit livestock grazing management by helping grazing permittees/lessees plan for drought, determine management options during drought and supporting sustainable forage production and grazing operations. Post-drought management has the potential to negatively impact livestock grazing and management in priority sage-grouse habitat areas in the short-term due to possible changes in management and AUMs. Post-drought management might be a negative impact in the short term, but would

be positive in the long term as plant communities are able to better recover from drought, maintaining their stability and flexibility.

All new structural range improvements, such as cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks, windmills, etc., would be avoided in sage-grouse priority and general habitat unless beneficial to the species, thus potentially reducing the amount of surface disturbing activities that would occur and resulting impacts to livestock grazing in the short term compared to Alternative A. However, this could potentially impact the achievement of long-term livestock and resource management goals compared to Alternative A. These impacts would only be realized in general habitat as priority habitat is prohibited from livestock grazing.

Grazing and trailing restrictions within lekking, nesting, brood-rearing, and winter habitats during times of the year when these habitats are utilized by sage-grouse would be placed on livestock operators under this alternative. This would make it more difficult for livestock operators to move their cattle, which could also affect the number of AUMs they are able to utilize. These restrictions would not be realized under any of the other alternatives.

Prohibiting new water developments under this alternative would decrease surface disturbing activities associated with development, thus maintaining current available forage for livestock in the short-term. However, enhancements to riparian vegetation and water quality, which would provide forage and water sources for livestock, would not be realized over the long-term. Water developments are used and needed for livestock, so limiting their development and resulting surface disturbance would help to improve the ecological health of the landscape and thereby improve vegetative/forage conditions. However, this would also limit the ability to provide water for livestock and wildlife and distribute livestock across allotments.

Closing priority and general sage-grouse habitat areas to fluid mineral leasing (which will prevent the construction of new oil and gas wells), unless there is an opportunity for the BLM/Forest Service to influence conservation measures where surface and/or mineral ownership is not entirely federally owned, would reduce the amount of vegetation removal and loss of available forage for livestock grazing, compared to Alternative A (Map 2-6). Approximately 16,878,220 acres would be closed to oil and gas leasing and 2,117,160 acres would be managed as NSO areas. Under this alternative, 9,533 BLM/Forest Service oil and gas wells and 1,594 CBNG wells would be anticipated in sage-grouse priority habitat areas, resulting in 85,140 acres that would experience short-term disturbance, and 27,030 acres that would be disturbed over the long-term. The number of wells anticipated would be 32% less than Alternative A, thus reducing the amount of vegetation removal and loss of available forage for grazing compared to Alternative A. These impacts will only occur in general habitat because priority habitat is prohibited from livestock grazing. Under Alternative C, agencies would explore options to amend, cancel, or buy out leases in ACECs and sage-grouse priority and general habitat, which would reduce oil and gas drilling and thus reducing forage loss for livestock. These impacts would only occur in general habitat as priority habitat is prohibited from livestock grazing.

The withdrawal of 6,992,690 acres from locatable mineral entry, based on the risk to the sage-grouse and its habitat from conflicting locatable mineral potential and development (Map 2-21), would result in the same impacts to livestock grazing as discussed in Alternative B.

Vegetation removal and loss of forage availability from non-energy, solid leasable mineral development would be reduced, relative to Alternative A. Under Alternative C, 6,992,690 acres would be closed to solid mineral development compared to 261,000 acres closed in Alternative A. New coal leases and coal exploration licenses within sage-grouse priority habitat areas would be prohibited, and additional screening processes would be implemented outside sage-grouse priority habitat areas. No new leases for other solid leasable minerals or mineral exploration by prospecting permits or licenses would be allowed inside sage-

grouse priority habitat areas, and mineral material exploration, sales, and free use permits would also be closed in sage-grouse priority habitat areas, subject to valid existing rights (Map 2-16). A reduction in these operations would reduce the amount of associated surface disturbance, and subsequently reduce the amount of vegetation removal and loss of forage availability. These impacts would only be realized in general habitat as priority habitat is prohibited from livestock grazing.

All sage-grouse priority habitat areas (6,992,690 acres) would be closed to mineral material exploration, sales, and free use permits, compared to 472,800 acres closed in Alternative A (Map 2-16). Reclamation of mineral pits no longer in use would return the grazing lands to the production levels found prior to development.

OHV use in the Casper, Rawlins, and Rock Springs Field Offices would result in the same impacts to livestock grazing as Alternative B.

Prohibiting new road construction within four miles of active sage-grouse leks and avoiding new road construction in sage-grouse priority and general habitat would reduce impacts to livestock grazing compared to Alternative A, in which prohibitions occur within 0.25 miles of occupied sage-grouse leks within specific parts of the planning area. A larger buffer zone around sage-grouse leks under this alternative would reduce the amount of surface disturbing activities from new road construction and therefore reduce the amount of vegetation removal and forage loss compared to Alternative A. Route construction would be limited to realignments of existing routes and mitigating efforts would be required if these efforts had impacts, thus reducing additional surface disturbing activities compared to Alternative A. Impacts associated with restoring roads and trails would be similar to those described in Alternative B. These impacts would only be realized in general habitat as priority habitat is prohibited from livestock grazing.

Impacts to livestock grazing from not reducing sagebrush shrub canopy cover to less than 15% would be similar to Alternative A, except they would occur within all priority and general sage-grouse habitat, thereby increasing the extent of the impacts. Vegetation treatment plans would establish non-grazing exclosures, thus placing short-term limitations in livestock management and temporary reductions of livestock grazing in treated areas compared to Alternative A. Vegetation community and production recovery in treated areas would be enhanced, increasing the post-treatment grazing capacity of treated lands in the long-term.

Impacts resulting from fire and fuels management would be similar to those under Alternative B, except realized over more acres and with a greater emphasis on ensuring long-term persistence of sagebrush. Lands would be managed to be in similarity to potential natural community, enabling a long-term balance of herbaceous and woody vegetation, thereby providing a stable forage source for livestock. Post fire recovery efforts would exclude livestock grazing until burned areas are fully recovered. This would displace livestock grazing in the short-term, but provide enhanced forage availability for livestock grazing in the long-term.

Impacts to livestock grazing from managing the density of disturbance on the landscape inside sage-grouse connectivity areas would be the same as those described under Alternative B.

Surface occupancy and disturbance activity prohibitions around sage-grouse leks inside sage-grouse priority habitat areas would be the same as those described under Alternative B. All of the impacts described under Alternative A would not be realized for activities related to oil and gas activities.

4.7.6 Alternative D

Allowing new transmission projects in existing utility corridors within a designated two-mile wide corridor through sage-grouse core and connectivity habitat areas and within 0.5 miles on either side of existing 115 kV or larger transmission lines, between July 1 and March 14 (or between July 1 and November 30 in winter concentration areas) (Map 2-12), would exclude a larger area from surface disturbing activities (5,230,110 acres), relative to Alternative A, in which 285,930 acres would be excluded. This could result in decreased vegetation removal and loss of forage available for livestock grazing compared to Alternative A. However, 1,300,510 acres of general sage-grouse habitat areas would be managed as avoidance areas for new ROWs, compared to 2,460,340 acres avoided in Alternative A, which could potentially increase the amount of surface disturbing activities and resulting forage loss that could occur compared to Alternative A.

Wind energy development activities would be excluded on 424,820 acres within sage-grouse habitat areas, and avoided on 4,608,420 acres (Map 2-32), unless declines in sage-grouse populations could be avoided through project design and/or mitigation. Compared to Alternative A, these restrictions would reduce the amount of surface disturbance, vegetation removal, and loss of available forage associated with wind energy development activities. Approximately 980 2-MW wind turbines are projected to be constructed across the entire planning area, which would be 22% fewer turbines than under Alternative A. Impacts to livestock grazing from the construction of new MET towers would be the same as those described in Alternative A.

Impacts from livestock grazing management would be the same as those described under Alternative A, except additional requirements (e.g., authorizing retirement of up to 15% within the individual planning unit for grazing allotments, incorporating sage-grouse habitat objectives and management objectives in core and connectivity habitat) may be placed on livestock operators when renewing grazing permits compared to Alternative A. Post-drought management impacts would be similar to Alternative A.

Impacts associated with structural range improvements, such as cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks, windmills, etc., would be similar to Alternative A, except modifications would be made to existing range improvements. These modifications would help to benefit livestock management and distribution. No new structural range improvements would occur under this alternative, which would decrease surface disturbing activities in the short-term, but could impact long-term livestock and resource management goals as operators would be prohibited from making future range improvements.

Authorizing water developments as needed within sage-grouse core and connectivity habitat would further increase vegetative resources available for livestock grazing compared to Alternative A.

Oil and gas leasing in sage-grouse core and connectivity habitat areas would be prohibited in the Raven Creek, Beaver Ridge, Fontenelle Creek, and East Anticline areas (119,500 total acres) (Map 2-7). Approximately 964,860 acres would be closed to oil and gas leasing and 2,117,990 acres would be managed as CSU areas. Under Alternative D, 13,083 BLM/Forest Service oil and gas wells and 2,686 CBNG wells would be anticipated in sage-grouse core and connectivity habitat areas, resulting in 44,050 acres that would experience short-term disturbance, and 9,160 acres that would be disturbed over the long-term. The number of wells anticipated would be 4% less than Alternative A. Not applying minimum lease sizes within sage-grouse core and connectivity habitat areas would have the same impacts to livestock grazing as under Alternative A.

Withdrawing core and connectivity habitat areas from locatable mineral entry (1,892,620 acres; Map 2-22), opening sage-grouse core and connectivity habitat areas to mineral material exploration, sales, and free use

permits (Map 2-17), and continuing to have salable mineral pits not in use available for other uses would all result in the same impacts to livestock grazing as discussed under Alternative A.

Impacts to livestock grazing from non-energy, solid leasable mineral development, as well as non-energy leasable mineral leasing, would be the same as those described under Alternative A, except impacts would also occur in the areas that were previously unavailable for leasing. Thus, an increase in surface disturbing activities and subsequent forage loss for livestock would occur.

OHV use in the Poison Spider OHV Park, part of the hill climb area in Section 33, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation area would result in the same impacts to livestock grazing as Alternative A.

Avoiding new road construction within 0.25 miles of occupied sage-grouse leks within all sage-grouse core and connectivity habitat areas would reduce impacts to livestock grazing compared to Alternative A, in which prohibitions only occur within 0.25 miles of occupied sage-grouse leks within specific parts of the planning area. The 0.25 mile restriction within all sage-grouse core and connectivity habitat areas (an additional 129,510 total acres) would result in less surface disturbance and subsequent forage loss, but to a lesser extent than Alternatives B or C.

Treated areas would not be rested from grazing under this alternative, thus short-term limitations in livestock management options would need to be implemented as necessary. Temporary reductions of livestock grazing would not be realized compared to Alternative A. However, vegetation community and production recovery in treated areas may not be enhanced, thus potentially decreasing the post-treatment grazing capacity of treated lands in the long-term.

The effects on livestock grazing resulting from fire management actions would be the same as those described under Alternative A.

Managing the density of energy production (excluding coal mining) and/or transmission structures (excluding buried pipelines or power lines) on the landscape inside sage-grouse core habitat would increase impacts to livestock grazing within the planning area long-term, compared to Alternative B. A limit of three energy production locations and/or transmission structures per 640 acres within the project impact analysis area could occur, and an additional 9% of total sagebrush habitat loss would be allowed under this alternative, compared to the 3% total permitted in Alternative B.

Restricting disruptive activity within a 0.25-mile radius of all occupied sage-grouse leks inside core habitat and connectivity habitat areas would not be applied as long as restrictions in Alternative A (14 days less), resulting in forage losses sooner. The amount of acres in which surface disturbing activities are restricted would decrease by 19% (75,870 acres in Alternative D versus 93,580 acres in Alternative A), thus increasing the amount of vegetation removal and forage loss resulting from surface disturbing activities compared to Alternative A.

4.7.7 Proposed Land Use Plan Amendments

Restricting utility structures within PHMAs would result in impacts to livestock grazing similar to Alternative A, except new transmission projects proposed outside of corridors would only be considered where it can be proven that sage-grouse populations could be avoided through project design and/or mitigation. Surface occupancy and surface disturbing activities for livestock grazing management would be prohibited on or within 0.6 miles of the perimeter of occupied sage-grouse leks. Surface disturbance, vegetation removal, and forage loss would likely decrease further, relative to Alternative A, due to these

requirements. However, reclamation activities similar to Alternative B would provide an increase in available forage for livestock over the long-term.

Wind energy development activities would be excluded on 425,080 acres within sage-grouse habitat areas, and avoided on 4,731,350 acres (Map 2-33), unless declines in sage-grouse populations could be avoided through project design and/or mitigation. Compared to Alternative A, these restrictions would reduce the amount of surface disturbance, vegetation removal, and loss of available forage associated with wind energy development activities. Approximately 127 2-MW wind turbines are projected to be constructed across the entire planning area, which would be 90% fewer turbines than under Alternative A. Land-clearing to construct new MET towers would be avoided within two miles of sage-grouse habitat, which would provide an additional acreage buffer compared to Alternative A, in which MET towers would only be avoided within one mile of sage-grouse habitat.

Impacts from livestock grazing management on BLM-administered lands would be the same as those described under Alternative A; however, additional requirements (e.g., incorporating site-specific sage-grouse habitat objectives and management objectives into all BLM grazing allotments, evaluating land health standards achievement in PHMAs and, where not achieved, to determine if existing grazing management practices or levels of grazing use on public lands are significant factors in failing to achieve the standards) would be placed on livestock operators, as appropriate, when renewing grazing permits compared to Alternative A. Post-drought management impacts would be similar to Alternative A, except the BLM and Forest Service would work with livestock grazing operators to develop drought contingency plans, which could increase flexibility in addressing drought conditions as part of livestock grazing practices.

On National Forest System lands, livestock grazing would be managed to achieve or maintain desired conditions in Greater Sage-Grouse seasonal habitats, as described in Tables 2-2 and 2-3. Livestock grazing would be managed to maintain residual herbaceous grass height for overhead and lateral concealment for Greater Sage-Grouse nesting and early brood rearing life stages. Wet meadows and riparian areas would be managed to sustain a rich diversity of perennial forb species relative to site potential, and winter habitat would provide sufficient sagebrush height and density for food and cover for Greater Sage-Grouse during this seasonal period.

Current direction for livestock grazing use on National Forest System lands in the planning areas is generally less restrictive than direction described under the Proposed LUP Amendments (Table 2-6). Therefore, grazing use guidelines under the Proposed LUP Amendments would directly impact livestock grazing management on National Forest System lands. Impacts could include modification of grazing strategies or rotation schedules, changes to the season of use, changes to kind and class of livestock, closure of a portion of an allotment, or reduction of livestock numbers. Implementation of this management direction could result in the reduction of AUMs on some allotments.

Implementation of these guidelines could also directly impact permittees by increasing the amount of time permittees spend to manage livestock on National Forest System lands as well as the total costs to a livestock operation. Impacts would occur at the allotment scale as management direction is incorporated into permits, allotment management plans (AMPs), and annual operating instructions. Management direction for livestock grazing under the Proposed LUP Amendments could decrease grazing in some allotments, and possibly overall operation viability. The level and intensity of impacts could vary on a site specific basis with permitted grazing likely decreasing moderately over time as permits are modified to achieve desired conditions and meet annual grazing use guidelines.

Indirectly, implementation of management direction to achieve desired conditions in Greater Sage-Grouse seasonal habitat as described in Table 2-5 could be beneficial to livestock grazing in the long-term,

particularly on allotments where rangeland conditions could be improved, by implementing management direction that improves rangeland conditions. Improved rangeland condition could also contribute to increased forage production.

Grazing direction under the Forest Service Proposed LUP Amendments would potentially affect about 470,530 acres in 170 allotments that support 226,362 AUMs. The distribution of these allotments, acres, and AUMs by administrative unit is displayed in Table 4-42.

Grazing use guidelines under Alternative E would potentially affect about 419,090 acres in 150 allotments that support 176,465 AUMs. Grazing use guidelines that limit forage use to 7 inches for perennial grasses during nesting season and 4 inches post nesting season would impact areas managed for nesting habitat within active grazing allotments (Table 4-42). The Proposed LUP Amendments grazing direction in areas managed for brood-rearing and summer habitat would potentially affect about 320,871 acres in 196 allotments that support 203,370 AUMs. The distribution of these allotments, acres, and AUMs by administrative unit is displayed in Table 4-42.

Table 4-42. Grazing Allotments and AUMs Potentially Affected on National Forest System Lands under the Proposed Land Use Plan Amendments

	Bridger-Teton NF	Medicine Bow NF	Thunder Basin NG	Total
# of Allotments that Overlap PHMAs or GHMAs	34	14	122	170
Allotment Acres that Overlap PHMAs or GHMAs	475,510	7,199	387,822	470,531
AUMs Potentially Affected by Proposed LUP Amendment Direction	1114,946	11,179	100,237	226,362

[1] Ranges vary according to grazing system (e.g., rest or deferred), season of use (e.g., early or late), range condition (e.g., satisfactory or unsatisfactory), vegetation type (e.g., alpine or non-native seeding), or other categories (e.g., greenline, key area, age class).

Under the Proposed LUP Amendments, sheep camps would not be located within 1.2 miles from the perimeter of a lek during lekking season and trailing of livestock during breeding and nesting seasons would be minimized during breeding and nesting seasons. This management direction would result in the need to modify grazing practices with increased costs for permittees in these areas.

Additional constraints under the Proposed LUP Amendments would also apply to structural range improvements in priority-core Greater Sage-Grouse habitat management areas compared to current plan direction. These include prohibiting fence construction or reconstruction within 4 miles from the perimeter of occupied leks unless the collision risk can be mitigated through design features or markings, not constructing new permanent livestock facilities (e.g., windmills, water tanks, corrals) within 0.6 miles in priority and 0.25 miles in general from the perimeter of occupied leks.

Prohibitions on new structural improvements could limit the ability of permittees to effectively distribute livestock resulting in increases in time and costs to permittees and potentially the full use permitted AUMs. Although these constraints could increase the amount of time permittees spend to manage livestock on

National Forest System lands, it should allow sufficient flexibility that permittees could continue to utilize structural range improvements to effectively distribute livestock.

Under the Proposed LUP Amendments, the Forest Service would consider closure of grazing allotments, pastures, or portions of pastures, or managing the allotment as a forage reserve as opportunities as opportunities arise where removal of livestock would enhance the ability to achieve desired habitat conditions as described in Table 2-5. These actions would occur according to applicable regulations and, if implemented, would result in the reduction of overall available AUMs.

On National Forest System lands, managing livestock grazing to achieve the desired conditions in Table 2-5 and livestock use guidelines in Table 2-6 may indirectly benefit rangeland conditions by increasing vegetation productivity and improving forage in the long term. This in turn would provide managers and permittees better management options, especially on those allotments where livestock numbers are approaching a sustainability threshold or during drought or other disturbances such as wildfire. Restoration activities under this alternative that reduce invasive annual grasses and other invasive plant species, conifers, and the spread and intensity of wildfire in Greater Sage-Grouse seasonal habitats would be beneficial to livestock grazing because these activities will improve rangeland conditions and increase forage production in the long-term. Restrictions that temporarily close areas to grazing could impact permittees and operations in the short term.

Continuing to evaluate and modify when necessary, existing range improvements (e.g., fences, watering facilities) for impacts on sage-grouse and its habitat within PHMAs and GHMAs would have reduced impacts to livestock grazing compared to Alternative A. Continuing to authorize supplements and supplemental feeding where appropriate would result in impacts to grazing as discussed under Alternative A.

Impacts to livestock grazing from fluid mineral leasing in PHMAs would be similar to those described in Alternative A, except fewer wells are anticipated. Under the Proposed LUP Amendments, 883,670 acres would be closed to oil and gas leasing, 441,690 acres would be managed as NSO areas, and 6,438,480 acres would be managed as CSU areas (Map 2-8). As a result, 12,355 BLM/Forest Service oil and gas wells and 2,462 CBNG wells are estimated to be constructed within the field office, resulting in 37,380 acres that would experience short-term disturbance, and 8,290 acres that would be disturbed over the long term. The number of wells anticipated would be 10% less than Alternative A, thus reducing the amount of vegetation removal and loss of available forage for livestock grazing. Application of a minimum lease size of 640 acres within PHMAs would help to prevent fragmentation and increased numbers of smaller-sized leases by reducing the potential for increased surface disturbance and subsequent forage loss, relative to Alternative A. There are exceptions for leases smaller than 640 acres, such as for regulatory compliance, but these exceptions would likely not be numerous enough to outweigh the reduction in vegetation removal and forage loss from minimum lease sizes.

On BLM-administered lands, impacts to livestock grazing from the withdrawal, proposed withdrawal, and consideration of proposed withdrawal of areas from locatable mineral entry within PHMAs (2,907,680 acres) (Map 2-23) would be similar to Alternative A, except the number of withdrawal acres would increase significantly (2,907,680 acres versus 1,892,620 acres under Alternative A), which could further reduce surface disturbing activities and thereby help to maintain forage for livestock grazing. On National Forest System lands, PHMAs would not be proposed for withdrawal from locatable mineral entry.

Impacts to livestock grazing from coal operations would be similar to Alternative A, except operations in PHMAs (except in unavailable areas) would implement measures where possible to protect habitat, which would decrease vegetative disturbance and loss of forage from associated surface disturbances (Map 2-28).

Impacts to livestock grazing from non-energy, solid leasable mineral operations could be less than Alternative A (Map 2-28). Short-term disturbance to vegetation from solid leasable mineral operations would still occur inside PHMAs (except in unavailable areas), but if revegetation efforts from mitigating measures were successful, long-term forage loss would be reduced.

Impacts associated with mineral material exploration, sales, and free use permits would be the same as described in Alternative A, except in PHMAs where restrictions to surface disturbance and disruptive activity may result in less surface disturbance, vegetation removal, and subsequent forage loss inside these areas (Map 2-18). However, these operations may be sited outside of PHMAs, in which case the impacts to grazing would be the same as Alternative A.

Managing the OHV use as "open" would result in surface disturbance and forage loss similar to Alternative A, except the non-sand dune portions of Dune Pond Cooperative Management Area and a portion of the Greater Sand Dunes Recreation Area would be managed as "limited to existing roads and trails." If recreational riders remain on existing roads and trails, vegetation would return off-trail, and forage availability for livestock grazing would increase. However, if recreational riders did not follow these designations, vegetation removal and forage loss would be equal to Alternative A.

Avoiding primary and secondary road construction within 1.9 miles of the perimeter of occupied sage-grouse leks and prohibiting road construction within 0.6 miles of occupied sage-grouse leks within PHMAs would reduce the amount of surface disturbance associated with these activities compared to Alternative A. Alternatively, these restrictions could potentially lengthen roads to avoid leks which would increase surface disturbing activities, increasing vegetation removal and the loss of forage where lengthened. Total surface disturbing activities would not exceed a 5% total within PHMAs (core only) under this alternative. These restrictions would lessen the amount of surface disturbance and resulting vegetation removal and forage loss, but not to the same extent as Alternative B or C.

ESR or burned area emergency response following a wildland fire would be focused on restoring habitat consistent with Greater Sage-Grouse habitat needs, to the extent practicable. This includes use of locally selected native seeds and of sagebrush where available, as well as temporary restrictions on grazing, motorized travel, and other uses. Impacts from ESR or burned area emergency response on the range program are expected to be the same or similar to those discussed under Impacts from Management of Fuels on Range Management but vary in scale, duration, and intensity.

Under the Proposed LUP Amendments, measures to protect Greater Sage-Grouse habitat from fire and associated fire operations would be beneficial to livestock grazing, especially in the 12-inch or less precipitation zone, because it would help prevent expansion of non-native invasive species such as cheatgrass. Although management to suppress and control the spread of wildfire under the Proposed LUP Amendments would decrease the risk of disturbance from wildfire in Greater Sage-Grouse habitat, fires outside of Greater Sage-Grouse habitat would possibly be at risk of decreased suppression efforts. Management direction to protect Greater Sage-Grouse habitat from fire in higher elevation sagebrush habitats (i.e., mountain big sagebrush) could indirectly negatively impact livestock grazing in the long-term as sagebrush potentially increases and forage production decreases.

Managing the density of disturbance on the landscape inside PHMAs would increase impacts to livestock grazing, compared to Alternative B. A limit of one oil and gas or mining location per 640 acres within the project impact analysis area could occur, and a 5% loss of sagebrush habitat would be allowed under this alternative, compared to the 3% total permitted in Alternative B. Although these limits would serve to reduce the amount of surface disturbance and associated forage removal, the degree of this impact would be reduced, compared to Alternative B.

Restricting surface occupancy and disturbance would result in impacts to livestock grazing similar to Alternative A, except the restrictions would cover a greater area. Surface disturbing activity and surface occupancy would be prohibited within 0.6 miles of occupied sage-grouse leks inside PHMAs and within 0.25 miles of occupied sage-grouse leks outside of PHMAs (Map 2-3). Under the Proposed LUP Amendments, 337,860 acres would be prohibited from surface occupancy and disturbance, compared to 68,550 acres in Alternative A, an increase of 393%. These restrictions would decrease the amount of surface disturbance and subsequent vegetation removal and forage loss, relative to Alternative A.

Under the Proposed LUP Amendments new recreation SUAs and expansion of SUAs would be restricted in PHMAs. In addition, terms and conditions that protect or restore Greater Sage-Grouse habitat would be included in new SUAs and existing permits and operating plans would be modified to protect and/or restore Greater Sage-Grouse habitat. Further, temporary recreation uses that result in the loss of Greater Sage-Grouse habitat would not be authorized, and new recreational facilities or expansion of existing recreational facilities (e.g., roads, trails, campgrounds) would not be approved in priority habitat unless the development results in a net conservation gain to Greater Sage-Grouse and/or their habitats.

This management direction would limit the direct and indirect impacts of recreation development on rangelands where livestock grazing is permitted, reducing disturbances to rangelands from recreational development and disturbances to livestock. However, this could also move impacts from recreation management to areas outside of PHMAs and GHMAs.

Under Proposed LUP Amendments management, new road or trail and construction would be prohibited in Greater Sage-Grouse habitat, and road construction within riparian and mesic meadows would be restricted. This direction would reduce impacts from roads rangeland and riparian areas. This could indirectly improve forage production and improve overall rangeland conditions. However, this could also move impacts from roads and transportation to areas outside of priority and general Greater Sage-Grouse habitats.

4.8 MINERALS AND ENERGY

This section presents potential impacts on mineral and energy resources, including renewable energy resources, from implementing management actions presented in Chapter 2. Existing conditions concerning mineral and energy resources are described in Chapter 3. Coal has its own set of planning regulations which includes the application of unsuitability criterion #15, protecting State High Sensitive Species, including sage-grouse. This analysis assumes areas identified as sage-grouse priority habitat would be determined to be unsuitable for further consideration for coal leasing and development, and therefore, no development of the coal resource would occur on these lands.

4.8.1 Impact Indicators

Indicators of impacts on fluid minerals are as follows:

- The number of oil, gas, and CBNG wells projected over the life of the plan
- The amount of land identified as closed to fluid mineral exploration and development
- The amount of land open to leasing subject to NSO stipulations
- The amount of land open to leasing subject to CSU stipulations
- The amount of land open to leasing subject to timing limitations
- Application of COAs on fluid mineral development activities on leased parcels for the protection of Greater Sage-Grouse
- Restrictions on geophysical exploration in Greater Sage-Grouse habitat
- The amount of land managed as ROW avoidance and exclusion areas.

Indicators of impacts on coal resources are as follows:

- The amount of land surface identified as unacceptable for coal leasing
- The amount of land surface identified as unsuitable for surface coal mining
- Application of siting, surface disturbance, and timing limitations on both surface and underground coal mining
- Application of surface disturbance and timing limitations and reclamation requirements for coal exploration.

Indicators of impacts on oil shale are as follows:

- The amount of land closed to oil shale leasing
- Acres subject to timing limitations
- Application of siting, surface disturbance, and timing limitations on oil shale mining
- Restrictions on geophysical exploration in Greater Sage-Grouse habitat.

Indicators of impacts on non-energy solid minerals are as follows:

- The amount of land closed to non-energy solid mineral leasing
- Acres subject to timing limitations.

Indicators of impacts on locatable minerals are as follows:

- The amount of land withdrawn from locatable mineral entry
- The amount of land recommended for withdrawal.

Indicators of impacts on mineral materials are as follows:

- The amount of land closed to mineral material disposal
- The amount of land subject to timing limitations.

Indicators of impacts on renewable energy are as follows:

- The number of wind turbines projected over the life of the plan
- The amount of land closed to wind energy development
- The amount of land with restrictions placed on wind energy development
- The amount of land managed as ROW avoidance and exclusion areas.

4.8.2 Assumptions

The analysis is based on the following assumptions:

- The potential for mineral resources is a prediction of the likelihood of the occurrence of these resources. The occurrence of a mineral resource does not necessarily imply that the mineral can be economically exploited or is likely to be developed; mineral occurrence potential includes both exploitable and potentially exploitable occurrences. The potential for the occurrence of a mineral resource also does not imply that the quality and quantity of the resource are known.
- Oil and gas leasing, exploration, and development will continue to occur in the planning area during the planning period.
- Leaseholders have the right to explore, develop, and produce mineral resources from any valid, existing lease, even if the area containing the lease were proposed to be closed to future leasing.
- A valid, existing mineral lease is a legally issued lease secured by a leaseholder before the effective date of the ROD for the RMPs/LRMPs being amended by this plan.
- Surface use restrictions, including timing limitation stipulations, NSO stipulations, CSU stipulations, and unavailable for leasing designations, would not be retroactively applied to valid, existing oil and gas leases or to valid, existing use authorizations (e.g., APD). Post-lease actions/authorizations (e.g., APDs, road/pipeline ROWs), however, could be encumbered by timing

limitations and CSU restrictions on a case-by-case basis, as required through project-specific NEPA analysis or other environmental review and consistent with existing lease rights.

- Directional drilling could be used to access hydrocarbon resources under areas constrained by surface use restrictions (e.g., NSO restrictions) that necessitate relocating wells outside the drilling window established by the Wyoming Oil and Gas Conservation Commission (WOGCC).
- Directional drilling viability and offset distance varies with the target formation, the top depth of the target formation, and formation productivity.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

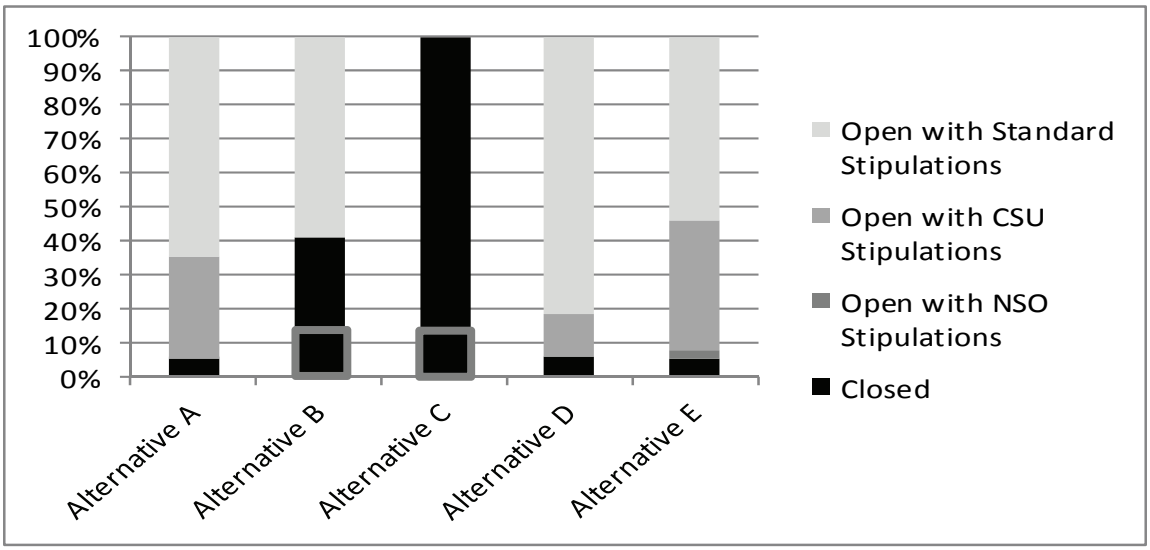
4.8.3 Alternative A

Alternative A identifies 871,780 acres, or 5% of federal surface and mineral estate in sage-grouse core and general habitat areas (Figure 4-1), as unavailable for new oil and gas leasing (Map 2-4 and Table 4-43). These closure areas would impact oil and gas development by making fewer acres of land available for new oil and gas leasing. Applying NSO stipulations on 40,980 acres and CSU stipulations on 5,015,210 acres within sage-grouse core and general habitat would increase the complexity of mineral operations, slow down the production of fluid minerals, and ultimately reduce the number of mineral operations. Outside of core and general habitat, oil and gas leasing would likely not change significantly under any alternative as a result of these plan amendments.

Table 4-43. Acres Closed to Oil and Gas Leasing in Sage-Grouse Habitat Areas

Restriction	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Acres closed to new oil and gas leasing	871,780	6,886,890	16,878,220	964,860	883,670
Percent of federal surface and mineral estate	5%	41%	100%	6%	5%
Projected number of oil and gas wells	13,653	11,555	9,533	13,083	12,355

Figure 4-1. Oil and Gas Leasing Categories as a Percent of Sage-Grouse Habitat Areas



Note: For Alternatives B and C, NSO overlaps closed areas, applying only to valid existing leases.

Based on the restrictions to surface disturbing and disruptive activities under this alternative, the RFD projection for fluid mineral development is 13,653 oil and gas wells and 2,758 CBNG wells during the planning period.

Prohibiting surface disturbing activities on 68,550 acres (Map 2-1) would not allow for the construction of well pads, access roads, pipelines, and ancillary facilities. Development in these areas would require the use of offsite methods, such as directional drilling to access oil and gas resources. In some cases, an operator could place a well pad, access road or production facility in a less-sensitive area and drill the well directionally to recover reserves underlying the area prohibited from surface disturbing activities. Directional drilling increases the risk of drilling problems such as stuck casing and diminished well production. Prohibiting and restricting surface disturbance (via lease/permit terms or withdrawal) ultimately decrease the number of oil and gas wells drilled during the planning period. Surface disturbing activity prohibitions would also limit the development of wind energy sites. The ability to develop wind energy sites would be dependent on the classification of the wind energy potential. For example, restrictions occurring in high wind energy potential areas would result in fewer opportunities for the development of wind energy.

Restricting surface disturbance on 93,580 acres (Map 2-1) could lead to the relocation of well pads, access roads, pipelines, and ancillary facilities. Relocation of these proposed facilities could cause temporary delays in developing oil and gas resources and could limit oil and gas activities in these areas. Restrictions could also lead to the relocation of wind energy development sites. These measures could cause temporary delays in developing wind energy. If suitable adjacent sites are not available, wind energy development would likely not occur.

Prohibiting geophysical exploration in some areas would limit the ability of mineral development companies to scout for and explore mineral potential in those areas. This could cause delays in mineral leasing applications and decrease or eliminate oil and gas development in these areas. Allowing geophysical exploration in some areas would avoid these impacts.

Timing and distance limitations, including seasonal closures, within sage-grouse core, connectivity, and general habitat on occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would shorten the season for development of oil and gas resources. These seasonal timing limitations could limit the operator's and/or leaseholder's ability to secure drilling and completion equipment during the peak drilling season. For deep wells that may require six months to drill, complete and install production facilities, phased operations would be necessary. Normal depth wells may require drilling and completion operations to be interrupted, and these activities would need to be completed in phases to accommodate the seasonal restrictions. Phased development would potentially decrease efficiency. In addition, timing limitations for human activity could preclude future leasing mineral activities, such as maintenance activities during this time period. Distance stipulations, such as sage-grouse lek buffers could lead to the relocation of well pads, access roads, pipelines, and ancillary facilities. Relocation of these proposed facilities could cause temporary delays in developing oil and gas resources and could limit oil and gas activities in these areas. Drainage of federal minerals on areas closed to leasing or on leases that are shut in on an annual basis due to timing and distance limitations may occur due to development on adjacent private or state lands. Restrictions would also shorten the season for development of wind energy. Some projects could require phased development which could delay project completion.

Exceptions to seasonal timing limitations could increase the operator's and/or leaseholder's ability to drill, complete, and install production facilities and to avoid phased development. Exceptions to lease stipulations, COAs and terms of conditions (T&Cs) considered on a case-by-case basis could allow oil and gas development to occur in areas or timeframes previously restricted.

ROW exclusion areas (285,930 acres) and avoidance areas (2,460,340 acres) (Map 2-9) and limiting ROWs and transmission projects to designated corridors in some areas could limit oil and gas and wind development within sage-grouse core and general habitat areas. ROWs are needed to provide access roads, transmission lines, and pipelines to well pads; as well as access roads and transmission lines to wind development sites. With this limited access to transportation and infrastructure, oil and gas projects could face delays and complications or be prevented from efficient use of mineral and energy resources.

Considering wind energy development in the planning area and within the sage-grouse core, connectivity, and general habitat areas, except in areas unavailable due to the protection of sensitive resources (Map 2-29), would allow wind energy development to occur without specific restrictions. In areas of sensitive resources, including SD/MAs, wilderness areas, wilderness study areas (WSAs), Visual resource Management (VRM) Class I and II areas, high and very high Scenic Integrity Objective (SIO) areas, and Visual Quality Objective (VQO) Retention areas, wind energy development would continue to be limited or precluded. Across the planning area, 424,820 acres would be excluded from wind development and 2,438,850 acres would be avoided from wind development. A total of 1,254 wind turbines are projected to be developed through 2020.

Minimizing noise levels by applying BMPs to noise generating activities such as oil and gas development and production in some field offices would have minimal impact on mineral development. Given the availability of noise reduction equipment and the latitude provided to an operator to implement noise reduction restrictions, the impact on mineral development could be minimal. If, however, noise reduction equipment is not available and an operator cannot commence operations without it, field development delays could occur.

Consideration of coal leasing within sage-grouse core, connectivity, and general habitat areas would allow for future development of these resources. Areas available for coal leasing would be dependent on the results of the coal screening process and the application of appropriate mitigation measures. Allowing coal exploration would enhance the development of these resources. Closing 338,533 acres would restrict the ability to develop these minerals over 2% of sage-grouse habitat areas.

Consideration of new leases in areas open to other solid leasable minerals (other than coal and oil shale) (Map 2-24) would allow for future development of these resources. Examples of solid leasable minerals include sodium (trona), phosphates and tar sands. Closing 261,000 acres would restrict the ability to develop these minerals over 1.5% of sage-grouse habitat areas.

Existing withdrawals (1,761,550 acres) and proposed withdrawals (131,070 acres) from locatable mineral entry in portions of sage-grouse core habitat areas to protect sensitive resources would restrict the ability to develop such resources over 28% of federal lands in those areas.

Allowing salable mineral development (e.g., mineral material exploration, sales and free use permits) (Map 2-14) in sage-grouse core, connectivity, general habitat areas would allow for the continued use and development of these resources. Closing 472,800 acres would eliminate these types of mineral resource uses over 7% of federal lands in sage-grouse habitat areas.

4.8.4 Alternative B

Under Alternative B, 6,886,890 acres would be closed to oil and gas leasing (Map 2-5 and Table 4-43), which represents a 700% increase in areas closed to oil and gas leasing compared to Alternative A and represents approximately 41% of the total federal surface and mineral estate within sage-grouse priority and general habitat (Figure 4-1). The increase in closure areas would reduce the number of projected oil, gas, and CBNG wells. NSO applied to valid existing leases on 2,117,160 acres would increase the complexity of mineral operations and slow down production. In total, 11,555 oil and gas wells (15% fewer than Alternative A) and 2,154 CBNG wells (22% fewer than Alternative A) are projected over the life of the plan under Alternative B.

Allowing or prohibiting geophysical exploration would have the same impact to mineral resources as described under Alternative A.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would restrict nearly all mineral development in these areas. Exceptions for existing leases entirely within protected perimeters would allow some development to proceed. Not allowing new surface occupancy within priority habitat, including winter concentration areas, would increase the complexity of mineral operations, requiring techniques such as directional drilling. This would restrict mineral and energy development to a greater extent than surface disturbance restrictions under Alternative A. New mineral leasing and energy development would be completely halted and existing leases would have to work around four-mile buffers with a cap on surface disturbance of one disturbance per section and no more than 3% total surface disturbance. This would ultimately place a limit on the pace of mineral development, as expressed by the number of well projections above. Drainage of federal minerals on areas closed to leasing or on leases that are shut in on an annual basis due to timing and distance limitations may occur due to development on adjacent private or state lands.

Not considering exceptions to lease stipulations for sage-grouse within priority habitat could limit the development of new oil and gas projects. These management actions could result in the relocation and/or delay of new minerals development and renewable energy projects.

Applying RDFs as mandatory stipulations and conservation objectives such as consolidation of infrastructure on existing leases could place additional restrictions on proponents holding valid existing leases. Additional restrictions could include consolidation of infrastructure and effective conservation of seasonal habitats. These restrictions could result in project delays and require directional drilling to recover potential reserves. However, the indirect effects of consolidating infrastructure over the life of multiple oil

and gas reserves could reduce the need for ancillary infrastructure over the larger region as infrastructure becomes more centralized, and less infrastructure would be necessary to deliver products downstream.

Applying BMPs to federal mineral estate where the surface ownership is non-federal could restrict the ability of mineral operators to efficiently develop mineral resources. Depending on the stipulations required, these requirements could increase delays in mineral development.

Expanding ROW exclusion to include all priority sage-grouse habitat (5,271,440 acres), expanding avoidance to all general habitat (6,357,180 acres), and limiting ROWs and transmission projects to designated corridors throughout the planning area (Map 2-10) would expand the impacts discussed under Alternative A to these larger areas. Not authorizing new transmission corridors could result in longer transmission routes and project delays.

Wind energy development would be excluded within sage-grouse priority habitat (Map 2-30). The elimination of potential wind energy development within sage-grouse priority habitat would be a significant impact compared to Alternative A. The increase in areas unavailable for wind energy development (5,033,240 acres closed compared to 424,820 acres under Alternative A) would reduce the number of projected wind turbines especially in areas of high potential for wind development. Based on these restrictions, 127 wind turbines (2 MW) are projected to be developed across the planning area through 2020. Compared to Alternative A, 1,127 fewer wind turbines (or 90% fewer) would be a significant decrease. As a result, less power would be generated and many development and construction activities would not occur.

Limiting noise levels to 10 dB at active lek perimeters within sage-grouse priority habitat areas would have more impact on oil and gas and wind energy developments by requiring additional equipment and infrastructure at development sites. Compared to Alternative A, this management action applies to the entire sage-grouse priority habitat areas and not just areas in the some field offices. Impacts would be the same, but expanded to these larger areas.

Closing priority habitat areas to coal exploration may result in a reduction of information necessary to plan for future coal leasing activities. Finding sage-grouse priority habitat unsuitable for leasing will result in existing coal mining operations unable to efficiently mine resources, loss of revenue from bonus and royalties from leasing and producing federal coal, and could lead to early closure of existing operations that cannot obtain sufficient coal resources from fee lands. In sage-grouse general habitat, a minimization of surface-disturbing or disrupting activities would be applied (including operations and maintenance) where needed to reduce the impacts of human activities on important seasonal sage-grouse habitats. These measures would be applied during activity level planning, in addition, effective mitigation to offset impacts as appropriate (determined by local options/needs). These measures would maintain intact sagebrush habitats throughout priority and general habitats. Timing and distance restrictions in priority habitat would inhibit future development of oil shale resources in those areas.

Not considering new leases for other solid leasable minerals (other than coal and oil shale) within sage-grouse priority habitat areas (Map 2-25) would prohibit future development of these resources and existing mines would be unable to expand operations to new federal lands. Closures would increase to 6,992,690 acres, which represents a 2,600% increase in closure areas, compared to Alternative A.

Existing withdrawals and pursuing withdrawals from locatable mineral entry within sage-grouse priority habitat (Map 2-20; 6,879,620 acres) could prevent future development of locatable minerals within these areas. Compared to Alterative A, in which potential withdrawals included only portions of priority habitat, this represents a 2,600% increase in withdrawal areas.

Closing sage-grouse priority habitat areas (6,992,690 acres) to salable mineral development (e.g., mineral material exploration, sales and free use permits) (Map 2-15) would prohibit the use and development of these resources. Compared to Alternative A, this represents a 1,400% increase in areas closed to salable mineral development.

4.8.5 Alternative C

Under Alternative C, 16,878,220 acres of priority and general habitat would be closed to oil and gas leasing (Map 2-6 and Table 4-43), which represents a 1,800% increase in areas closed to oil and gas leasing compared to Alternative A and represents 100% of the total federal surface and mineral estate within sage-grouse priority and general habitat (Figure 4-1). NSO stipulations applied to valid existing leases on 2,117,160 acres would be the same as Alternative B. Compared to Alternatives A and B, the increase in closure areas would reduce the number of projected oil, gas, and CBNG wells. In total, 9,533 oil and gas wells (30% fewer than Alternative A) and 1,594 CBNG wells (42% fewer than Alternative A) are projected over the life of the plan under Alternative C. New mineral leasing and energy development would be completely halted and existing leases would have to work around four-mile buffers with a cap on surface disturbance of 1 disturbance per section and no more than 3% total surface disturbance. This would ultimately place a limit on the pace of mineral development, as expressed by the number of well projections above.

Prohibiting geophysical exploration (except valid existing rights) in priority and general sage-grouse habitat would increase the impacts to mineral resources as described under Alternative A. Delays in mineral leasing applications and oil and gas development would be expanded and some development could be precluded entirely.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would have the same impact to minerals as Alternative B, except that requirements would be extended to disruptive activities as well, which would further limit the ability of mineral operators to access operations during restricted seasons. Not allowing new surface occupancy within priority habitat, including winter concentration areas (timing and distance stipulations) would be the same as under Alternative B.

Not considering exceptions to lease stipulations, COAs, and T&Cs would have a similar impact to minerals as under Alternative B, except impacts would be expanded to include both priority and general habitat.

Applying RDFs as mandatory stipulations and conservation objectives would have the same impact to minerals as under Alternative B.

Prohibiting the construction of evaporation reservoirs to hold CBNG wastewater would increase the complexity and decrease efficiency of waste disposal for CBNG operations by requiring alternative means of wastewater disposal.

Applying BMPs to federal mineral estate where the surface ownership is non-federal would have the same impact to minerals as under Alternative B.

Amending, cancelling, or buying out leases in ACECs and sage-grouse priority and general habitat would remove potential mineral development off the market. Buy-out of federal mineral leases requires approval and appropriation from Congress. Such minerals could never be developed, if mineral lease buy-outs were approved. Including conditions that require relinquishment of leases/authorizations for mitigation could preclude potential mineral development and/or infringe upon valid existing rights where leases/authorizations have been issued.

Prohibiting new roads within four miles of active sage-grouse leks and avoiding new road construction in priority and general habitat would limit access to mineral and wind energy development sites. Roads are required for development, operations, and maintenance associated with oil, gas, and wind energy infrastructure. These restrictions could result in longer routes, limited access, and less oil and gas and wind energy development.

Expanding ROW exclusion to include all priority and general sage-grouse habitat (11,556,490 acres, expanded from Alternative B) (Map 2-11) and limiting ROWs and transmission projects to designated corridors (same as Alternative B) would expand the impacts discussed under Alternative A, to larger areas than Alternative B.

Wind energy development would be excluded within priority habitat and general habitat (expanded from Alternative B with 11,531,340 acres closed compared to 424,820 acres under Alternative A) (Map 2-31). Based on these restrictions, 127 wind turbines could be developed across the planning area through 2020, resulting in impacts similar to those discussed under Alternative B.

Prohibiting industrial solar projects in ACECs and occupied habitat would reduce potential renewable energy development in those areas. Solar projects could be reduced in size, extent or number, or forced to change locations, possibly to areas with less solar potential.

Restrictions regarding noise levels would have the same impact to minerals as under Alternative B.

Impacts to coal leasing and other solid minerals (Map 2-26) would be the same as Alternative B.

Consideration of impacts to locatable mineral entry (Map 2-21) would be the same as Alternative B.

Closing sage-grouse priority habitat area to salable minerals (e.g., mineral material exploration, sales, and free use permits) (Map 2-16) would be the same as Alternative B.

4.8.6 Alternative D

Under Alternative D, 964,860 acres would be closed to oil and gas leasing (Map 2-7 and Table 4-43), which represents an 11% increase in areas closed to oil and gas leasing compared with Alternative A and represents approximately 6% of the total federal surface and mineral estate within sage-grouse priority and general habitat (Figure 4-1). This alternative would have similar impacts to minerals as under Alternative A, with a slight increase in closure areas and CSU stipulations on 2,117,990 acres within sage-grouse core, connectivity, and general habitat, which would reduce the number of projected oil, gas, and CBNG wells. Closed areas would be expanded to include Raven Creek in the Newcastle Field Office and three areas in the Pinedale Field Office. In total, 13,083 oil and gas wells (4% fewer than Alternative A) and 2,686 CBNG wells (3% fewer than Alternative A) are projected over the life of the plan under Alternative D. Drainage of federal minerals on areas closed to leasing or on leases that are shut in on an annual basis due to timing and distance limitations may occur due to development on adjacent private or state lands.

Allowing or prohibiting geophysical exploration would have the same impact to mineral resources as described under Alternative A.

Restricting surface disturbance on 75,870 acres (Map 2-2) would have a similar impact as described under Alternative A, except on fewer acres. However, prohibiting surface occupancy and disruptive activities within 0.25 miles of occupied leks and implementing seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A in some areas and remove them in others. Overall, there would be

more area with these limitations. Density limitations of three locations per 640 acres and a 9% disturbance cap within core habitat would displace mineral development, since the restrictions would apply to all surface-disturbing activities. This would slow mineral development and could also lead to the relocation of well pads, access roads, pipelines, and ancillary facilities. Relocation of these proposed facilities could cause temporary delays in developing oil and gas resources and limit oil and gas activities in these areas.

Exceptions to lease stipulations, COAs, and T&Cs would have the same impact to minerals as Alternative A.

Applying RDFs as mandatory stipulations and conservation objectives would have the same impact to minerals as under Alternative B.

Avoiding occupied sage-grouse leks with a 0.25-mile buffer (Map 2-12) would reduce access to mineral development on a smaller scale than Alternative C. Restrictions such as longer routes, limitations to access, and less oil and gas and wind energy development would be minimal compared to Alternative C.

Managing core and connectivity habitat areas as ROW exclusion areas (5,230,110 acres) (Map 2-12) with 1,300,510 acres as avoidance outside core and connectivity areas would increase the impacts described under Alternative A. Inside core and connectivity areas, impacts to minerals would be the same as Alternatives B and C. In general habitat areas, impacts to minerals would be the same as Alternative A. The management of ROW corridors would have the same impact to minerals as Alternative A.

Avoiding wind turbines in core and connectivity habitat, unless it can be shown that sage-grouse populations would not decline, would reduce the total number of wind turbines in the planning area (Map 2-32). As a result, 980 wind turbines are projected to be developed across the planning area through 2020. Compared to Alternative A, this is 274 or 22% fewer wind turbines. However, compared to Alternatives B and C, this would be nearly 8 times as many turbines, mainly because of disturbance restrictions that would be applied to wind energy development under Alternatives B and C.

Restrictions regarding noise levels would have the same impact to minerals as under Alternative A.

Impacts to coal leasing, oil shale leasing, and other solid minerals (Map 2-27) would be the same as Alternative A. Withdrawing lands from locatable mineral entry (Map 2-22) would be the same as Alternative A.

Impacts from closing areas to salable minerals would be the same as those discussed under Alternative A.

4.8.7 Proposed Land Use Plan Amendments

Under the Proposed LUP Amendments, 883,670 acres would be closed to oil and gas leasing (Map 2-8 and Table 4-43), which would be slightly more than under Alternative A. This, in addition to other restrictions, such as NSO on 441,690 acres and CSU on 6,438,480 acres within PHMAs and GHMAs would reduce the number of projected oil, gas, and CBNG wells projected under the Proposed LUP Amendments, but less than the decreases that would occur under Alternatives B and C. In total, 12,355 oil and gas wells (10% fewer than Alternative A) and 2,462 CBNG wells (11% fewer than Alternative A) are projected over the life of the plan under the Proposed LUP Amendments. Drainage of federal minerals on areas closed to leasing or on leases that are shut in on an annual basis due to timing and distance limitations may occur due to development on adjacent private or state lands.

Allowing or prohibiting geophysical exploration would have the same impact to mineral resources as described under Alternative A.

Prohibiting surface disturbing activities on 337,860 acres (Map 2-3) would result in the same type of impacts as those described in Alternative A, except 269,310 more acres would be prohibited. Restricting surface disturbance on 160,630 acres (Map 2-3) would have the same impact as described in Alternative A, except these restrictions would occur on 67,050 additional acres. Density limitations of one oil and gas or mining location per 640 acres and a 5% disturbance cap within PHMAs (core only) would have impacts similar to those described under Alternative D, but on a larger area. Less mineral development would be allowed to occur under this alternative than Alternatives A and D. Prohibiting surface occupancy and disruptive activities within 0.6 miles of occupied leks and seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A. Timing and distance impacts would be greater than Alternative D, but less than Alternatives B and C.

Exceptions to lease stipulations, COAs, and T&Cs would have the same impact to minerals as Alternative A.

Applying RDFs as mandatory stipulations and conservation objectives would have the same impact to minerals as under Alternative B.

Applying BMPs to federal mineral estate where the surface ownership is non-federal would have the same impact as under Alternative B.

Avoiding primary and secondary roads within 1.9 miles of the perimeter of occupied sage-grouse leks and prohibiting other new roads within 0.6 miles of the perimeter of occupied sage-grouse leks within PHMAs would have similar impacts as Alternative A, except impacts would be increased because there would be fewer places where new roads needed for mineral development could be constructed. Loss of access to mineral development under this alternative would be greater than Alternative D, but less than Alternatives B and C.

The management of ROW exclusion areas (285,930 acres) (Map 2-13) within PHMAs and GHMAs (Map 2-13) would be the same as under Alternative A. The management of ROW corridors would have the same impact to minerals as Alternative A.

The development of wind energy would have impacts similar to those identified under Alternative A (Map 2-33), except avoidance areas would increase to 4,731,350 acres. As a result, approximately 127 wind turbines would be developed across the planning area through 2020. Compared to Alternative A, there would be 1,127 fewer wind turbines (or 90% fewer).

The impacts on mineral development activities resulting from minimizing noise levels near sage-grouse leks would be similar to those described under Alternative A, except additional restrictions to reduce noise could further impact mineral development operations. Limiting noise levels at the perimeter of sage-grouse leks to not exceed 10 dBA above ambient noise would further increase requirements for operators and could result in field development delays.

Impacts to coal leasing, oil shale leasing, and other solid minerals would be the same as Alternative A.

On BLM-administered lands, continuation of existing withdrawals and pursuing/considering new withdrawals from locatable mineral entry within portions of PHMAs (1,761,550 and 1,146,130 acres, respectively; Map 2-23) could prevent future development of these resources within these areas. Compared to Alterative A, in which proposed withdrawals would be applied to 131,070 acres, this represents a 600% increase in areas recommended for withdrawal from locatable mineral entry. Locatable mineral withdrawal would not be recommended on National Forest System lands.

Impacts to salable minerals (e.g., mineral material exploration, sales, and free use permits) (Map 2-18) would be the same as under Alternative D.

4.9 PALEONTOLOGY

This section presents potential impacts on paleontological resources from management actions for sage-grouse habitat, as presented in Chapter 2. Because public lands within the planning area often have more bedrock exposures than adjacent private lands that have historically been homesteaded for ranching purposes, there may actually be more potential for vertebrate or scientifically significant paleontological resources on public land than adjacent private lands.

The analysis of environmental impacts is based on interdisciplinary team knowledge of resources and the project area, review of existing literature, and information provided by other agencies and institutions. Effects are quantified where possible. In cases where quantitative data are not readily available, best professional judgment or qualitative assessments are used to describe impacts.

4.9.1 Impact Indicators

Indicators of impacts on paleontological resources are as follows:

- Changes in acres where surface disturbing activities are restricted or prohibited
- Extent of allowable development (e.g., minerals, ROWs)
- Changes in human presence in areas where paleontological resources occur.

4.9.2 Assumptions

The analysis is based on the following assumptions:

- Scientifically significant fossils will continue to be found within the planning area throughout several geologic formations exposed at the surface.
- Inventories required prior to surface disturbance in high-probability areas would result in the identification and evaluation of previously undiscovered resources, which the BLM and Forest Service would then manage accordingly.
- Surface disturbing and other disruptive activities could dislocate or damage paleontological resources that were not discovered prior to surface disturbance (i.e., unanticipated discoveries). Destruction of these resources would result in a loss of scientific information and preclude interpretation of the resource values to the public.
- In some cases, surface-disturbing activities, such as mineral development, can have the effect of exposing fossils that would have otherwise remained undiscovered.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.9.3 Alternative A

Management actions under this alternative which prohibit or restrict surface disturbance within the planning area could protect paleontological resources within those areas (Map 2-1). Unmitigated surface-disturbing activities could damage or destroy paleontological resources that were unknown before that activity. Surveys performed prior to surface disturbance will not always locate all fossil material; therefore, surface disturbances in surveyed areas may still damage undiscovered paleontological resources. Under

Alternative A, surface disturbing activities would be prohibited on 68,550 acres and restricted on 93,580 acres.

Not allowing new ROW corridors within sage-grouse core and general habitat areas would protect those areas from potential surface disturbance and sub-surface disturbance from ROWs in those corridors that could damage or destroy paleontological resources as a result of developing or using those corridors. Designating corridors would not directly impact paleontological resources; the impact is derived from the use of those corridors. Using existing ROW corridors and restricting the width of those corridors would limit disturbance to those areas but still impact paleontological resources within the corridor. For management actions that allow the width of the corridor to expand, additional damage to paleontological resources could occur. Under this alternative, 285,930 acres would be designated as exclusion areas for ROWs while 2,460,340 acres would be designated as avoidance areas for ROWs. Excluding ROWs from specific areas would protect paleontological resources in those areas from surface disturbances that could be caused by potential development. Avoiding surface disturbance could also protect paleontological resources if the avoidance restrictions dissuade surface disturbing activities in these areas. If the avoidance stipulations result in fewer surface disturbing activities, the paleontological resources in these areas would be protected from incidental disturbance. However, because the stipulation is merely to "avoid" surface disturbance, such activities could still take place under certain conditions. Therefore, these avoidance areas would not provide complete protection on paleontological resources in these areas. Related to the protection associated with the avoidance stipulations, there may also be fewer paleontological inventories in these areas associated with surface disturbing activities.

Allowing wind energy development within sage-grouse core habitat areas, except in areas that are currently unavailable to protect sensitive resources, could impact paleontological resources in those areas that are not protected (Map 2-29). The primary impact from wind energy development would be surface disturbance during construction and maintenance of the turbines that could damage or destroy paleontological resources in those areas. Under this alternative, 424,820 acres would be excluded from wind development and 2,438,850 acres would be avoided from wind energy development. MET towers would cause similar impacts to those of wind energy turbines with respect to surface disturbance and damage to paleontological resources. Because wind turbine and MET sites are ROW actions, the locations and acres in which these could occur are the same as those described above for ROWs.

Since fossils are considered part of the surface estate, disposal of public surface containing known or previously undocumented paleontological resources results in an adverse impact to paleontological resources due to the loss of fossils and the lack of protective measures for paleontological resources when under private ownership. Conversely, any management action that allows acquisition of lands within the planning area containing paleontological resources results in a beneficial impact to paleontological resources due to the protective measures offered under federal ownership and the gain of public fossils.

Areas containing active livestock grazing allotments could impact the paleontological resources in those areas. Removing livestock, creating seasonal stipulations and other methods to restrict use, but still allow grazing, could reduce the level of damage to paleontological resources. Damage from livestock grazing to paleontological resources could occur from trampling and increased erosion of soil. Monitoring of the range and vegetation to ensure land health standards are being met could assist in protecting paleontological resources if livestock grazing is reduced. Considering livestock water developments and range improvements to maintain or improve resource conditions, enhance livestock distribution, or both, could create surface disturbance that could damage paleontological resources. However, improving range conditions to reduce erosion could indirectly benefit paleontological resources.

Allowing fluid mineral leasing in sage-grouse core habitat areas (Map 2-4) would create surface disturbance that could impact paleontological resources in those areas. However, the impact would not occur until a

fluid mineral project has begun development. Oil and gas leasing would be closed on 871,780 acres while NSO stipulations would be in place on 40,980 acres and CSU stipulations on 5,015,210 acres. Paleontological resources could be impacted by the development of 13,653 oil and gas wells and 2,758 CBNG wells. Total surface disturbance for these wells would be 130,330 acres for oil and gas and 39,050 acres for CBNG wells. Although surface disturbance does not automatically infer damage to paleontological resources for all of these areas and acres, it is anticipated that damage would occur on land where paleontological resources exist.

Establishing mitigation measures as a condition of approval for an APD, such as offsite placement of facilities, remote control monitoring, restricted or prohibited surface use, and constructing multiple wells from a single pad, would help to protect paleontological resources from surface disturbance. Also, working with project proponents to site their projects in locations that minimize impacts to sensitive resources could protect paleontological resources from potential damage.

Areas within the planning area that are open to mineral materials, locatable and solid leasable minerals development could have an impact on paleontological resources found in those areas, depending on the extent of development and surface disturbance. Impacts from developing these minerals would be the same as those described for fluid minerals, but would vary somewhat in size and intensity. Areas closed to mineral materials (Map 2-14) on 472,800 acres, locatable minerals (Map 2-19) on 1,892,620 acres and non-energy, solid leasable minerals (Map 2-24) on 261,000 acres, would indirectly protect paleontological resources from surface and sub-surface disturbance by not allowing development in these areas.

Allowing dispersed recreation in the planning area would not require paleontological authorization and would not result in significant impacts on paleontological resources. While the recreational collecting of common invertebrate fossils is permissible, the uninformed and/or willful collection of significant and therefore protected paleontological resources could result in the damage to or complete removal of significant fossil resources from the public lands.

Transportation planning that provides for access to achieve multiple-use goals while providing for protection of resources could impact paleontological resources through surface disturbing activities related to the construction of new roads (to provide access to new mineral, wind or ROW developments for construction and/or maintenance purposes). This would also increase access to areas of public lands. Without sufficient law enforcement associated with recreational activities, actions such as off-road travel, inadvertent vandalism and unpermitted collecting could result in a loss of paleontological resources and information.

The range of alternatives allows for limited treatment of vegetation, including mechanical, wildland or prescribed fire use, and chemical methods. Wildland fire use and prescribed fire could result in direct and indirect impacts on paleontological resources. Fire could cause the direct destruction of organic fossil remains. The removal of vegetative cover by fire would accelerate erosion in the short-term, thereby creating indirect impacts, although these impacts are negligible compared to similar impacts that occur by natural processes. The restrictions on fuels management, wildland fire management, and ESR would limit the adverse impacts of exposed ground surface and actions taken for fire suppression in Greater Sage-Grouse habitat that could expose fossils, limiting the potential for collecting scientifically important paleontological resources. Indirect impacts, such as soil or wind erosion, could expose more fossils.

Fewer restrictions on core habitat would have greater impacts on protection of paleontological resources with greater fire suppression actions. Restrictions on fuels management, wildland fire management, and ESR designed to protect Greater Sage-Grouse habitat would decrease paleontological scientific knowledge due to fewer paleontological surveys and incidental excavations. Fire could cause the direct destruction of organic fossil remains. Existing sites within core habitat would have greater protections, preserving known

discovery sites for future scientific study. The fewest restrictions on core habitat would have greater impacts on protection of paleontological resources in Alternative A.

Damage to paleontological resources could occur as a result of surface disturbances caused by wildland fire suppression activities (e.g., construction of fire lines, bulldozing access roads, and general movement of heavy equipment) and indirect instances of increased erosion, although fire itself has nearly no effect. Because of the unplanned nature of wildland fires, the impacts on paleontological resources from wildland fire suppression activities would generally be unmitigated. Ground-disturbing activities during firefighting actions and post fire rehabilitation activities could damage or destroy known and unknown significant paleontological resources.

Utilizing an integrated management technique approach with the goal of minimizing the potential for unplanned wildland fires or that lessen suppression activities would indirectly protect paleontological resources. Increased erosion from loss of vegetation following wildland fires could accelerate exposure and deterioration of paleontological resources. Identification of known localities and sensitive areas during fire planning efforts would allow for possible avoidance or modification of fire suppression activities, such as reducing the use of heavy equipment in paleontological sensitive areas.

4.9.4 Alternative B

Management actions under this alternative which prohibit or restrict surface disturbance within the planning area could protect paleontological resources within those areas. Unmitigated surface-disturbing activities could damage or destroy paleontological resources that were unknown before that activity. Surveys performed prior to surface disturbance will not always locate all fossil material; therefore, surface disturbances in surveyed areas may still damage undiscovered paleontological resources.

Not authorizing new transmission corridors would have the same impact to paleontological resources as not allowing new ROWs in newly designated corridors under Alternative A. Managing priority sage-grouse habitat areas as exclusion areas for new BLM ROWs or Forest Service SUAs would also have the same impact as managing ROW exclusion areas in Alternative A; however, the number of acres protected would be greatly expanded (Map 2-10). Under this alternative, 5,271,440 acres would be designated as exclusion areas for ROWs, while 6,357,180 acres would be designated as avoidance areas for ROWs (Map 2-10). Impacts from managing areas as ROW avoidance would be the same as those described in Alternative A; however, the number of acres would be greatly expanded.

Evaluating and taking advantage of opportunities to bury existing power lines within priority sage-grouse habitat could potentially impact paleontological resources through surface and sub-surface disturbance that could damage or destroy these resources.

Retaining public ownership of sage-grouse priority habitat could provide greater protection to paleontological resources from potential disturbance as opposed to identifying acres of public lands for disposal within sage-grouse habitat in Alternative A.

Identifying areas where acquisitions or conservation easements would benefit sage-grouse would have the same impact on paleontological resources as acquisitions in Alternative A.

Closing priority sage-grouse habitat areas to fluid mineral leasing, as opposed to allowing leasing in Alternative A, could protect paleontological resources that may be found in those areas from potential surface and sub-surface disturbance (Map-2-5).

Allowing geophysical exploration within sage-grouse priority habitat could impact paleontological resources in these areas through surface and sub-surface disturbing activities associated with geophysical exploration.

Limiting OHV use to designated roads and trails in areas that are currently open to cross-country OHV would decrease impacts compared to Alternative A. Vegetation loss would be eliminated as the areas of existing disturbance would continue to be used, with no additional loss from riding on undisturbed areas. Impacts from OHV use to vegetation and soils would be concentrated to areas that have already been disturbed and hardened, reducing the potential to impact paleontological resources.

Increased restrictions on sage-grouse priority habitat would have fewer impacts on paleontological resources. Management actions for wildland fire management would have the same impacts as those in Alternative A.

Developing and implementing sage-grouse monitoring plans would have the same impact as those in Alternative A.

Managing priority sage-grouse habitats so that discrete anthropogenic disturbances cover less than 3% of the total sage-grouse habitat would help to protect paleontological resources from the same disturbance in these areas.

Not allowing new surface occupancy on federal leases within priority habitats would help to protect paleontological resources from impacts associated with surface disturbance.

4.9.5 Alternative C

Relocating existing designated ROW corridors crossing sage-grouse priority habitat would have the same impact as described in Alternative B for this same action.

Managing sage-grouse priority and general habitat areas as ROW exclusion areas for new ROW or SUA permits would have the same impact as Alternative B; however, the area of potential impact would be greatly expanded from 5,271,440 acres in Alternative B to 11,556,490 acres in Alternative C (Map 2-11).

Excluding wind energy development in sage-grouse priority and general habitat areas would reduce surface disturbance, potentially protecting paleontological resources in those areas. Siting wind energy development at least five miles from active sage-grouse leks could also protect paleontological resources in those buffer areas.

Avoiding new MET towers within one mile of occupied sagebrush obligate habitats would have the same impacts as those described in Alternative A for the same action.

Prohibiting industrial solar projects in ACECs and occupied sage-grouse habitats could reduce surface disturbance, potentially protecting paleontological resources in those areas from damage.

Retaining public ownership of sage-grouse priority habitat would have the same impacts as those described in Alternative B for the same action.

Identifying areas where acquisitions or conservation easements would benefit sage-grouse habitat would have the same impacts as those described in Alternative B.

Acquiring important private lands in BLM-designated ACECs and Forest Service Sage-Grouse Special Areas could help protect these areas from potential surface disturbance that could cause damage to paleontological resources.

Prohibiting livestock grazing within sage-grouse priority habitat could protect paleontological resources in these areas from potential damage by livestock trampling.

Closing sage-grouse priority and general habitat areas to fluid mineral leasing would have the same impacts as those described in Alternative B for the same action. However, the number of closed acres would be expanded to 16,878,220 acres (Map 2-6), allowing for protection of paleontological resources over a much larger area.

Not issuing new geophysical permits within priority and general sage-grouse habitat could reduce potential surface and sub-surface disturbance that would result from these activities. This, in turn, could protect paleontological resources from damage within those areas.

Prohibiting construction of evaporation or infiltration reservoirs to hold coalbed methane wastewater could help protect paleontological resources from activities that could damage or destroy these resources.

Finding all surface mining of coal unsuitable in sage-grouse priority habitat could protect paleontological resources in these areas from potential surface disturbing activities that would damage or destroy these resources (Map 2-26).

Closing priority habitat to non-energy leasable mineral leasing would have the same impacts as those described in Alternative B for the same action.

Recommending withdrawal from mineral entry in priority habitat would have the same impact on paleontological resources as Alternative B (Map 2-21).

Closing sage-grouse priority habitat areas to mineral material exploration would have the same impacts as those described in Alternative B (Map 2-16).

Designating all sage-grouse priority habitat areas and Audubon Important Bird Areas as sage-grouse conservation ACECs/SIAs, as well as designating large ACECs, could indirectly protect paleontological resources in these areas that might otherwise be open to surface disturbing activities.

Designating all OHV open areas within sage-grouse priority habitat areas as limited to designated roads and trails would have the same impacts as those in Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails would have the same impacts as those described in Alternative B.

Prohibiting new road construction within four miles of active sage-grouse leks and avoiding new road construction in sage-grouse priority and general habitat could protect paleontological resources from damage that could potentially result from such activities within these buffer areas.

Not allowing new surface occupancy on federal leases within priority habitats would have the same impacts as those in Alternative B for the same action.

4.9.6 Alternative D

Allowing new transmission projects in existing designated utility corridors (and outside existing corridors if activity will not cause declines in sage-grouse populations) within sage-grouse core and connectivity habitat areas could impact paleontological resources through potential surface disturbance, if developed.

Managing sage-grouse core and connectivity habitat areas as ROW exclusion areas for new ROW or SUA permits would have similar impacts to those described in Alternatives A, B and C, however the area impacted would be more similar to Alternative B when comparing number of acres (Map 2-12). Under this alternative, 5,230,110 acres would be designated as exclusion areas and 1,300,510 acres would be avoidance areas.

Excluding wind energy development on 424,820 acres in sage-grouse habitat (Map 2-32) would have similar impacts to paleontological resources as those described in Alternative A. However, under Alternative D, 22% fewer wind turbines are projected for development because 4,608,420 acres would be avoided from wind energy development (compared to an avoidance of 2,438,850 acres under Alternative A).

Avoiding new MET towers within one mile of occupied sagebrush obligate habitats would have the same impacts as those described in Alternative A under the same action.

Retaining ownership of sage-grouse core and connectivity habitats would have the same impacts as those in Alternative B under the same action.

Acquiring lands based on a variety of economic resources criteria could help to protect paleontological resources that might be found in those areas by placing them under federal land management policies and practices.

Impacts to paleontological resources from managing fluid mineral leasing and development would be similar to those discussed under Alternative A, except an increase in the areas closed to fluid mineral leasing (964,860 acres; Map 2-7) would reduce the level of related surface disturbance by 6%. This would reduce the potential for damage and degradation of paleontological resources caused by surface disturbance related to fluid mineral development.

Solid mineral leasing would be prohibited on 261,000 acres (Map 2-27), which is the same as Alternative A and the Proposed LUP Amendments. Impacts from solid mineral leasing would be similar to those described in Alternative A. Considering leasing of non-energy leasable minerals within sage-grouse core and connectivity habitat, except in areas where sensitive resources are located would also have similar impacts to those described in Alternative A.

Withdrawing portions of sage-grouse core and connectivity habitat from mineral entry would have the same impacts as those described in Alternative A for the same action (Map 2-22).

Managing sage-grouse core and connectivity habitat areas as open to mineral material exploration, sales, and free use permits would have the same impacts as those described in Alternative A.

Impacts to paleontological resources associated with dispersed recreation would be the same as those described in Alternative A.

Impacts to paleontological resources associated with travel management would be the same as those described in Alternative A.

Prohibiting or restricting surface occupancy within a 0.25-mile radius of the perimeter of occupied sage-grouse leks would help to protect paleontological resources from surface disturbing activities within these buffer areas.

4.9.7 Proposed Land Use Plan Amendments

Allowing new transmission projects within the two-mile wide transmission line corridor through PHMAs would have similar impacts to those described in Alternatives A and D under the same action. The additional stipulations presented in this alternative would not necessarily reduce the impacts to paleontological resources, other than reducing some of the areas where surface disturbance would be allowed from ROW or SUA activities. However, total acres that would be excluded from ROW activities (285,930 acres) would be much less than in Alternatives B, C, and D (Map 2-13).

Managing PHMAs and GHMAs as avoidance areas for new ROW or SUA permits would have similar impacts to paleontological resources as those described in Alternative A, except the area in which ROWs/SUA permits are avoided would be increased to 6,208,990 acres (Map 2-13).

Excluding wind energy development on 425,080 acres in sage-grouse habitat (Map 2-33) would have similar impacts to paleontological resources as those described in Alternative A. However, under the Proposed LUP Amendments, 90% fewer wind turbines are projected for development because 4,731,350 acres would be avoided from wind energy development (compared to an avoidance of 2,438,850 acres under Alternative A).

Retaining public ownership of PHMAs would have the same impacts as those described in Alternative D.

Impacts to paleontological resources from managing fluid mineral leasing and development would be similar to those discussed under Alternative A, except an increase in the areas managed with NSO and CSU stipulations (441,690 and 6,438,480 acres, respectively; Map 2-8) would reduce the level of related surface disturbance by 14%. This would reduce the potential for damage and degradation of paleontological resources caused by surface disturbance related to fluid mineral development.

Impacts from coal surface mining methods would be the same as those described in Alternative D. Impacts from non-energy, solid leasable minerals would be similar to those identified under Alternative A, except the amount of acres closed would increase to 483,420 acres (Map 2-28). When compared with Alternatives B and C, the Proposed LUP Amendments would protect fewer acres (483,420 acres as opposed to 6,992,690 acres) from surface and sub-surface disturbance that would result from solid leasable mineral development.

Areas open to mineral material exploration, sales and free use permits (Map 2-18) would have the same impacts as those described in Alternatives A and D and the Proposed LUP Amendments, with some additional stipulations that could provide additional protection to paleontological resources from surface disturbing activities related to mineral material development.

Management of dispersed recreation would result in impacts similar to those described in Alternative A. However, negative impacts to Greater Sage-Grouse habitat from BLM SRPs and Forest Service Recreation SUAs would be adequately mitigated under this alternative, which could reduce the level of some recreation activities in many locations of the field office and thereby reduce the potential for damage to paleontological resources.

Designating all OHV open areas within PHMAs as limited to existing roads and trails would have the same impacts as those described in Alternatives B and C.

Prohibiting surface occupancy and surface disturbing activities within 0.6 miles radius of occupied sage-grouse leks in PHMAs and within 0.25 miles of sage-grouse leks outside of PHMAs could help protect paleontological resources from damage within those buffer areas.

4.10 RECREATION RESOURCES

This section presents potential impacts on recreational activities and the recreation program from implementing management actions presented in Chapter 2. Existing conditions concerning recreation are described in Chapter 3.

The BLM and the Forest Service provide opportunities for outdoor recreation and nature-based tourism under the concept of multiple-use management. Recreation activities include casual public recreation on both developed and undeveloped sites, permitted recreation activities and events through the use of Special Recreation Permits (SRPs) and SUAs, and the management of Special Recreation Management Areas (SRMA). Impacts to recreation stem from the removal or restriction of recreation activities or from conflicting activities that result in a decline in the recreational experience.

Although some OHV use is a recreational activity, impacts to OHV use is closely associated with impacts to transportation road networks. Therefore, impacts to OHV use are discussed below in this section (Section 4.10) and in the Transportation and Access section (Section 4.15).

4.10.1 Impact Indicators

Indicators of impacts on recreation are as follows:

- The number of SRPs (BLM) and SUAs (Forest Service) issued
- The amount of access to recreation areas
- The number and acreage of OHV "open" areas
- The mileage of designated routes and trails
- The amount of surface disturbing and disruptive activities, non-recreation buildings and facilities, and human presence
- The amount of use conflicts
- The level of visitor satisfaction/recreation user benefits.

4.10.2 Assumptions

This impact analysis is based on the following assumptions:

- The demand for most recreation activities will continue to increase (Wyoming State Office of Travel and Tourism 2006; Haas 2002; Cole 1996; Mueller et al. 2002).
- Most recreation use in the planning area is casual use.
- Most recreation use in the planning area is dispersed (i.e. undeveloped) recreation.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.10.3 Alternative A

Allowing recreation through SRPs (BLM) and SUAs (Forest Service) allows the continued use of public lands for recreation purposes. Recreation uses, such as hunting, camping, driving recreational OHVs, and many other specialized uses of public lands are common within all portions of the planning area. In some field offices, limitations may be placed on recreation permitting in order to protect some sage-grouse habitat areas, which could limit the use of certain lands for recreation purposes.

Limiting travel to designated routes would close most of the planning area to cross-country travel. Most recreational activities would take place on routes that would be designated, once route designation planning has occurred. Impacts to OHV use are discussed in more detail in the Transportation and Access section of this document.

"Open" OHV areas (i.e., Poison Spider OHV Park, Dune Pond Cooperative Management Area, and Greater Sand Dunes Recreation Area) would increase the availability of motorized recreation opportunities. Other recreation opportunities in these areas would be diminished because some recreational uses conflict with the noise, speed, and dust of motorized vehicles, such as hunting, hiking, biking, and backpacking.

Surface disturbing activities from ROWs, mineral and energy development, livestock management, and fuels and vegetation treatments could reduce the quality of recreation experiences in some parts of the planning area where roads, trails, dispersed camping areas, and other such types of recreation occur near oil and gas leasing, mining activities, including coal and trona, non-energy solid mineral leasing, mineral materials exploration and sales, wind energy development, utility facility development, and transmission line development occurs. Development may also reduce populations of game species, which could reduce hunting success levels and the overall quality of hunting experiences. Hunting and fishing account for the most visitor use days of any other recreational activity in the planning area. Visual impacts of surface disturbance reduce the naturalness of back-country recreation and reduce opportunities for solitude. Traffic congestion from mineral development also reduces the quality of recreation experiences to the point where displacement may occur.

Prohibiting surface disturbing activities on 68,550 acres and restricting surface disturbance on 93,580 acres would reduce the overall level of surface disturbance resulting from permitted activities. Most recreation uses would be enhanced from such actions, especially primitive and undeveloped types of recreation, which rely on quiet solitude for user satisfaction. For example, reducing surface disturbance, primarily from oil, gas, and wind development, would also reduce the impacts of increased traffic, higher noise levels, visual intrusions, and public health and safety concerns.

Density and disturbance restrictions, which vary by field office, could further restrict the development of recreation infrastructure in some areas. Trailheads and camping areas that contain access roads, parking lots, and/or buildings such as restrooms would be held to the same restrictions. Future recreation infrastructure development such as this could be limited in some areas; however, there is often some latitude on the location of such infrastructure. Impacts could be avoided by relocating recreation facilities away from sage-grouse leks. However, density restrictions would also prevent surface disturbance and disruption from development activities and would enhance recreation opportunities such as hunting, fishing, motorized OHV use, camping, and hiking by removing use conflicts such as unsightly facilities and structures, fences, additional road traffic and congestion, and noise.

Seasonal timing limitations on occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas and seasonal restrictions on disruptive activities would reduce the level of development in these areas during the time periods listed in Chapter 2. Reducing development activities allows for fewer conflicts with recreational activities. Although these restrictions would not

impact the casual use of most recreational activities, they could impact SRPs/SUAs. Hunting outfitting and guiding services make up the bulk of SRPs/SUAs issued across the planning area. This could place a temporal or seasonal restriction on SRPs/SUAs, if the area of interest and hunting season coincided with sage-grouse leks, nesting/early brood-rearing habitat, and winter habitat during closures. However, the impact could be low because typical hunting seasons for big game and other species occur in the fall, which would not coincide with the winter and spring restrictions required for sage-grouse. For casual use recreation, a reduction in development and traffic during these times and seasons would create more opportunities for solitude and pristine and undeveloped recreation.

Applying ROW exclusion (285,930 acres) and avoidance areas (2,460,340 acres) (Map 2-9) within core and general habitat and limiting ROWs and transmission projects to designated corridors in some areas would serve to consolidate utility ROWs and structures. This would reduce the extent of disturbed areas, which would reduce visual impacts to recreation opportunities and enhance user experience where solitude and a pristine setting are part of the expectation.

Allowing the development of leasable minerals (e.g., oil, gas, coal, and non-energy minerals), locatable minerals, and salable minerals (would increase human presence and the use the heavy equipment in sage-grouse core habitat areas, which would decrease the pristine nature of some recreational activities. User conflicts between mineral development activities and recreation could occur, such as traffic congestion, visual impacts, and dust and noise. Oil and gas leasing allowances would result in the development of 13,653 oil and gas wells and 2,758 CBNG wells during the planning period. This would cause an estimated 130,330 acres of short-term surface disturbance and 39,050 acres of long-term disturbance.

Allowing wind energy development in the planning area (Map 2-29) would reduce the visual qualities of the landscape, which reduces many visitor recreational experiences, especially activities where quiet solitude and natural settings are a part of the experience. Construction of wind turbines could also noticeably increase traffic and congestion in some areas, which would further reduce the quiet and solitude of many recreation experiences. A total of 1,254 wind turbines are projected to be constructed across the planning area through 2020.

4.10.4 Alternative B

Allowing recreation through SRPs (BLM) and SUAs (Forest Service) that only have beneficial or neutral effects to priority habitat areas could reduce recreational uses of public lands discussed under Alternative A.

Limiting motorized travel to existing roads, primitive roads, and trails could make some otherwise available travel routes unavailable. Recreation areas could be harder to access and motorized recreation could see closure of routes that might eventually continue to be open once the designation process has completed.

Designating all but the sand portion of OHV “open” areas as limited to designated roads and trails would delete much of the cross-country motorized recreation opportunities within the planning area. There would be considerably fewer opportunities than under Alternative A.

Not allowing new surface occupancy within priority habitat, including winter concentration areas, would have similar impacts as prohibiting or restricting surface disturbance under Alternative A.

NSO restrictions on new leases within priority habitat and limiting permitted disturbances to one per section with no more than 3% surface disturbance would reduce the total amount of surface disturbance allowed in priority habitat, compared to density limitations discussed under Alternative A. Recreation taking place in these areas would have fewer impacts from development activities, more quiet and solitude, and better

opportunities for hunting large game. The disturbance limitations could affect recreation facilities, if any were needed within priority habitat areas.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would have similar impacts as under Alternative A, except to a greater extent due to increased areas where surface disturbance is seasonally limited and surface disturbing activities are prohibited. This could further limit access for permitted recreational opportunities. Casual recreation would not be impacted.

Expanding ROW exclusion to include all priority sage-grouse habitat (5,271,440 acres), expanding avoidance to all general habitat (6,357,180 acres), and limiting ROWs and transmission projects to designated corridors throughout the planning area (Map 2-10) would reduce the impacts to recreation discussed in Alternative A, as more area would be left natural for solitary and undisturbed recreation opportunities.

Applying oil and gas lease stipulations (Map 2-5) would reduce the short-term surface disturbance by 20% from Alternative A to 104,050 acres and reduce the long-term disturbance by 14% to 33,530 acres. Overall, 11,555 oil and gas wells (15% fewer than Alternative A) and 2,154 CBNG wells (22% fewer than Alternative A) are projected over the life of the plan under Alternative B. This would reduce use conflicts with recreation discussed under Alternative A. Determining core habitat areas to be unsuitable for coal leasing, closing these areas to non-energy mineral leasing (Map 2-24), withdrawing the lands from locatable mineral entry (Map 2-19), and closing lands to mineral material exploration, sales and free use permits (Map 2-14) would reduce the occurrence of these types of mineral development compared with Alternative A, which would reduce conflicts with recreation activities, such as dust, noise, and traffic congestion.

Wind energy development as discussed under Alternative A would be excluded within sage-grouse priority habitat (Map 2-30). For the entire planning area, the number of wind turbines would be reduced from 1,254 under Alternative A to 127 (a 90% reduction). The exclusion of potential wind energy development would reduce visual impacts from remote and back-country recreation opportunities.

4.10.5 Alternative C

Allowing recreation through SRPs (BLM) and SUAs (Forest Service) would be the same as under Alternative B, except seasonally prohibiting non-motorized recreation within 4 miles of active leks would eliminate recreation in those areas during closed seasons.

Limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative B.

Impacts from OHV use, particularly in areas designated as “open” under Alternative A would be the same as described under Alternative B.

Not allowing new surface occupancy within priority habitat, including winter concentration areas (timing and distance stipulations) would be the same as under Alternative B.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would be the same as Alternative B, except that requirements would be extended to disruptive activities as well, which could displace more types of permitted special recreation uses, such as large group activities.

Expanding ROW exclusion to include all priority and general sage-grouse habitat (11,556,490 acres, expanded from Alternative B) (Map 2-11) and limiting ROWs and transmission projects to designated corridors (same as Alternative B) would reduce the impacts discussed under Alternative A, more so than under Alternative B.

Oil and gas leasing would not be open on any areas within priority and general sage-grouse habitat under Alternative C (Map 2-6). This would remove impacts discussed under Alternative A for all, except valid existing leases. This would reduce the short-term surface disturbance by 35% from Alternative A to 85,140 acres and reduce the long-term disturbance by 31% to 27,030 acres. Overall, 9,533 oil and gas wells (30% fewer than Alternative A) and 1,594 CBNG wells (42% fewer than Alternative A) are projected over the life of the plan under Alternative C. Impacts discussed above from minerals management on recreation would be the least under this alternative. Impacts from coal leasing; non-energy leasable minerals (Map 2-25); locatable mineral entry (Map 2-20); and mineral material exploration, sales, and free use permits (Map 2-15) would have the same impact on recreation as under Alternative B.

Siting wind turbines at least five miles from active leks could reduce visual impacts to recreation from wind turbines in some areas, but could increase them in areas where there are no active leks (Map 2-31). For the entire planning area, the number of wind turbines would be reduced from 1,254 under Alternative A to 127 (a 90% reduction and the same as Alternative B). The removal and reduction of potential wind energy would significantly decrease visual, noise, and traffic impacts to recreation discussed under Alternative A.

Prohibiting industrial solar projects in ACECs and occupied habitat would decrease impacts to recreation in these areas. Solar projects create visual impacts to back-country recreational areas. Limiting them in natural areas would reduce conflict with recreation uses.

4.10.6 Alternative D

Allowing recreation through SRPs (BLM) and SUAs (Forest Service) on a case-by-case basis would be effectively the same impact as under Alternative A. Some types of recreation, specifically where large groups are involved could be eliminated in sage-grouse core and connectivity habitat areas.

Limiting motorized travel to designated routes would be the same as Alternative A.

Impacts from OHV use would be the same as Alternative A.

Impacts from restricting surface disturbance (Map 2-2) would have similar impacts as described in Alternative A, except 75,870 acres would be restricted and none would be prohibited. This could allow the impacts described under Alternative A to increase in some areas, however restrictions would be increased within sage-grouse core and connectivity habitat areas, which would reduce recreation conflicts with development activities.

Density limitations of three locations per 640 acres and a 9% disturbance cap within core habitat would limit noise, visual intrusions, user conflict, and traffic congestion impacts from development activities, but less so than NSO restrictions under Alternatives B and C.

Seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A in some areas and remove them in others. Overall, there would be more area with these limitations, but the types of impacts would be the same.

Managing 5,230,110 acres of core and connectivity habitat as ROW exclusion areas, with 1,300,510 acres as avoidance (Map 2-12) outside core and connectivity areas would increase the effects described under Alternative A for the planning area. Inside core and connectivity areas, impacts to recreation would be the same as Alternatives B and C, but in general habitat areas, impacts would be the same as Alternative A. The management of ROW corridors would be the same as Alternative A.

Oil and gas leasing would be allowed on 15,974,241 acres under Alternative D (Map 2-7), which would be about 1% less than under Alternative A. Compared to Alternative A, areas closed to oil and gas leasing would be expanded to include Raven Creek in the Newcastle Field Office and three areas in the Pinedale Field Office. This would reduce impacts from minerals management on recreation compared to Alternative A, but less so than Alternatives B and C. Estimated short-term surface disturbance would be reduced by 6% from Alternative A to 122,910 acres and long-term disturbance would be reduced by about 3% to 37,720 acres. Overall, 13,083 oil and gas wells (only 4% fewer than Alternative A) and 2,686 CBNG wells (only 3% fewer than Alternative A) are projected over the life of the plan under Alternative D. Impacts from coal leasing would be of the same type as described under Alternative A, but on less area. Coal leasing would occur on more area than Alternatives B and C, thus the impacts on recreation would be greater than those alternatives. Non-energy leasable minerals (Map 2-26) would be allowed on approximately the same area as Alternative A, but with more mitigation aimed at protecting sagebrush habitat, which would reduce impacts to recreation as well. Locatable mineral entry (Map 2-21), mineral material exploration, sales, and free use permits (Map 2-16) would have the same impact to recreation as under Alternative A.

Avoiding wind turbines in core and connectivity habitat, unless it can be shown that sage-grouse populations would not decline (Map 2-32), would reduce the total number of wind turbines in the planning area to 980 (a 22% reduction from Alternative A). This would reduce recreation conflicts and visual impacts, specifically in sage-grouse core and connectivity habitat areas.

4.10.7 Proposed Land Use Plan Amendments

Allowing recreation through SRPs (BLM) and SUAs (Forest Service) except where negative impacts to PHMAs couldn't be mitigated would have similar impact as under Alternative D.

Limiting motorized travel to designated routes would be the same as Alternative A.

Impacts from OHV use would be the same as Alternative A, except in non-sand dune portions of "open" areas within PHMAs, which would become limited to existing roads and trails. Such areas could see fewer visual impacts from OHV use, but would also experience a decrease in the amount of area open for motorized recreation.

Prohibiting surface disturbing activities on 337,860 acres (Map 2-3) would have the same impacts as described in Alternative A, except 269,310 more acres would be prohibited. Restricting surface disturbance on 160,630 acres (Map 2-3) would have the same impact as described in Alternative A, except impacts would occur on 67,050 additional acres.

Density limitations of one oil and gas or mining location per 640 acres and a 5% disturbance cap within PHMAs (core only) would have impacts similar to those described under Alternative D, but limitations to noise, visual intrusions, user conflicts, and traffic congestion would be expanded to a larger area. Less surface disturbance would be allowed, which would reduce conflicts with recreation activities.

Seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A. Timing and distance impacts would be greater than Alternative D, but less than Alternatives B and C.

The management of ROW exclusion and avoidance areas within PHMAs and GHMAs would be similar to the impacts described under Alternative A, except that there would be more avoidance areas, which could reduce impacts to recreation from ROWs. The management of ROW corridors would be the same as Alternative A.

Compared to Alternative A, oil and gas leasing restrictions, such as NSO and CSU would be greatly increased (Map 2-8), which would further reduce conflicts with recreation activities as discussed under Alternative A. Estimated short-term surface disturbance associated with the development of oil and gas wells would be reduced by 14% from Alternative A to 112,330 acres and long-term disturbance would be reduced by 9% to 35,430 acres. Overall, 12,355 oil and gas wells (10% fewer than Alternative A) and 2,462 CBNG wells (11% fewer than Alternative A) are projected over the life of the plan under the Proposed LUP Amendments. This would provide more protection than Alternatives A and D, but less than Alternatives B and C.

Avoiding wind turbines in PHMAs, unless it can be shown that sage-grouse populations would not decline (Map 2-33), would reduce the total number of wind turbines in the planning area to 127 (a 90% reduction from Alternative A). This would reduce recreation conflicts and visual impacts, specifically in PHMAs.

4.11 SOCIOECONOMICS

This section presents potential economic and social impacts from management actions for sage-grouse habitat as presented in Chapter 2. Existing social and economic conditions and trends are summarized in Chapter 3 and detailed in the Socioeconomic Baseline Report (BLM 2012a).

Note that in an economic and social analysis, the term "impact" may construe either positive or negative outcomes. The "direction" of the impact should be clear from the context, but may also vary depending on the perspective of the reader. For instance, the generation of jobs and income is considered by most people to be a positive effect. Where jobs or income are lost (for instance, under one alternative compared to another), this will be explicitly indicated in the text below. Social impacts may be judged differently by different stakeholders. For example, stakeholders who tend to view natural resource development as essential to their communities may view rapid oil and gas development as aligned with their personal and community interests, while others who tend to favor conservation may feel it is contrary to their or their community's interests.

Some socioeconomic impacts are addressed quantitatively below. Many impacts, including both economic and social impacts, can only be addressed qualitatively, given available information and resources.

4.11.1 Impact Indicators

Indicators of impacts to socioeconomics are as follows:

- The number of new oil and gas wells drilled on federal mineral estate within sage-grouse habitat, as estimated in the RFD based on the constraints on future well drilling activity resulting from all management decisions.
- The level of wind energy development activity (megawatts (MW) of new capacity developed) across the planning area, based on the relative availability of land for wind energy development given the constraints on such development resulting from all management decisions.
- The estimated number of AUMs used within sage-grouse habitat, based on billed AUMs in recent years and management decisions that clearly and quantifiably affect permitted AUMs.
- The number of recreation visits on BLM or Forest Service land within each field office or planning unit, based on estimates from the BLM Recreational Management Information System (RMIS) and the Forest Service National Visitors Use Monitoring (NVUM) program.
- Management decisions that affect the costs of utility projects.
- Management decisions regarding land tenure that affect the availability of land for economic activities (e.g., land disposals that allow for land development), or that affect the generation of property taxes or Payments in Lieu of Taxes (PILT).
- Management decisions that affect the costs of livestock grazing operations.
- Management decisions that affect the practices of grazing operators in ways that may affect levels of grazing use (e.g., decisions regarding grazing in riparian areas).
- Management decisions affecting voluntary relinquishment of grazing permits or grazing preference, to the extent that permits or AUMs are actually retired.

- Management decisions affecting levels of geophysical exploration activity.
- Management decisions that affect the costs of oil and gas development.
- Management decisions that affect levels or costs of other mineral exploration and development, such as coal exploration, locatable mineral development, etc.
- Management decisions that affect the costs of wind energy development.
- Management decisions affecting recreational access and services provided for recreational users.
- Management decisions that may result in BLM or operator expenditures (e.g., for reclamation of closed travel routes, reclamation of surface disturbances, fencing, vegetation treatments, wildland fire fuels management, etc.).
- Management decisions that may affect levels of non-market values, such as recreational use (consumer surplus), maintenance of open space and iconic values associated with ranching, preservation of Greater Sage-Grouse, and natural environmental functions that provide ecosystem service values to humans.
- Levels of oil and gas development or wind energy development that could affect local population growth or the influx of temporary workers, and thus affect provision of public services, changes to community cohesiveness, and other social impacts.
- Management decisions that affect quality of life, attitudes and beliefs, cultural values associated with certain land uses, and other social and cultural impacts of uses of BLM-administered lands and National Forest System lands.

4.11.2 Assumptions

The analyses in this section are based on the following assumptions:

- Economic benefits to the socioeconomic study area (defined in Chapter 3), in terms of labor earnings and employment, would accrue from BLM and Forest Service-influenced activities such as oil and gas development, wind energy development, livestock grazing, and recreation.
- Employment and income (especially labor earnings) would continue to be a driver of economic and population growth in the socioeconomic study area.
- Housing supply and costs and community infrastructure and services may be constraints on population growth in some locations within the planning area.
- Tax and royalty revenues derived from activities on BLM-administered lands and National Forest System lands would continue to have fiscal implications for communities within the socioeconomic study area, the state, and the Federal Government.
- Activities and resources available in and around the planning area would continue to be important to the quality of life of current and future residents.
- The pace and timing of mineral development activities is dependent on a variety of factors outside the management decisions of the BLM and Forest Service. These include national and international energy demand and prices, production factors within the planning area and business strategies of

operators. 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 these parameters allow for projection of future oil and gas production volumes for use in the economic impact analysis. Actual economic impacts could vary if actual development or production varies from the projections, or if prices change.

- The pace and timing of wind energy development activities are also dependent on a variety of factors outside the management decisions of the BLM and Forest Service. These include demand for electricity, availability of transmission infrastructure capacity, prices for other energy sources such as coal for electricity generation, costs of wind energy generation technologies, production factors within the planning area, and business strategies of operators. The analysis below uses a wind deployment scenario developed from multiple sources. Actual impacts could vary if the rate of development over the study period is different.

- Demand for use of BLM-administered lands and National Forest System lands for livestock grazing will continue through the study period.

- Demand for use of BLM-administered lands and National Forest System lands for recreational activities, including OHV use, throughout the planning area will remain steady or increase through the study period.

- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

Additional assumptions for the analysis are discussed in Appendix N, Technical Report: Social and Economic Impact Analysis Methodology.

4.11.3 Methods of Analysis

Economic Impact Analysis

The analysis below of economic impacts that are reflected in market transactions uses two general approaches (see the later subsection regarding non-market values). These are quantitative and qualitative analyses.

The quantitative analysis approach is used when possible given adequate available information and resources. In this study, adequate data was available for four resource uses: oil and gas, wind energy, livestock grazing, and recreation. The basic strategy used is to first identify the primary impacts of an economic activity affected by management decisions. For instance, primary impacts include expenditures made by oil and gas companies to drill a well, and to complete the well for production. Primary impacts also include the value of the oil and gas that is produced and sold. Next, where primary impacts can be quantified, they can generally also be run through an economic model to estimate the economic activity that is generated as the primary impact ripples through the economy; “upstream” to providers of goods and services necessary for production; and “downstream”, as income generated from production is spent by the households that receive the income.

The upstream, downstream, and total effects are estimated in this study through use of the IMPLAN (IMPact analysis for PLANning) model. The IMPLAN model was originally developed by the Forest Service and is commonly used by the BLM and many other government and private sector organizations to estimate the total economic impacts of various activities, actions, and policies. The model tracks inter-industry and consumer spending in a local (or regional) economy, allowing estimation of indirect and induced economic impacts in the local economy that result from the original economic activity or a change in economic

activity. Indirect impacts result from local inter-industry purchases caused by the direct impact, and induced impacts results from re-spending of labor income (i.e., local purchases by households of employees and proprietors of the affected industries). The re-spending represented by indirect and induced impacts is often referred to as the "multiplier effect." Outputs of the IMPLAN model include employment, labor income, and gross regional economic output. It is important to note that IMPLAN, based on some of its data sources, does not distinguish between full-time and part-time jobs. Sectors with higher labor earnings per job are likely to reflect a high proportion of full-time jobs, while sectors with low labor earnings per job often reflect a significant number of part-time jobs.

The IMPLAN model uses data specific to the local economy wherever possible, but also uses some data based on national-level economic relationships. Therefore, the model benefits from "calibration" of some of its data to better reflect the local economy. For this study, IMPLAN was calibrated based on work the University of Wyoming has done with the model in Wyoming over many years and with data specific to this study. The specific IMPLAN impact analysis methodology and assumptions for each resource use are described in Appendix N, Technical Report: Social and Economic Impact Analysis Methodology.

In the other approach, where primary impacts cannot be readily quantified, often the economic impacts can still be described qualitatively. In such cases, the focus of the analysis is to describe the type of impact in a base scenario (here, Alternative A) and then assess the relative changes (qualitative indications of increases or decreases in costs or the value of production) that would be likely under other alternatives.

Some of the management decisions under this planning action would result in increased costs to operators – the firms or individuals who undertake the activities – or to project proponents. The economic impacts of decisions that increase costs for operators and/or project proponents are many and can be complex. Cost increases may cut into profitability and drive delays to, reductions in, or cessation of operations or projects. However, where operations or projects are not delayed, reduced, or terminated, increased costs also represent increased economic activity. For instance, if restrictions under an Alternative result in a new power line having to take a longer route, additional expenditures for materials, equipment, and labor would be made. These increased expenditures would support some amount of additional income and employment. However, increased costs may also represent opportunity costs; that is, the project proponent or society may have benefited more if the additional funds were used in another way. In the analysis below, where management actions would potentially increase costs to operators or project proponents, these increased costs are pointed out and discussed qualitatively. Readers should keep in mind that these increased costs may negatively impact operators, may benefit others in society, and may incur opportunity costs.

Base Year Dollars and Discounting

All dollar figures throughout the economic analysis are in constant 2011 dollars. This is the base year used in the IMPLAN model.

All dollar figures in the summary results tables below represent the total value across the period 2013 to 2020. This is the only period within the larger planning period for which the necessary quantitative input data was available for all four resource uses. Values for future years are *discounted* to adjust for the "time value of money." This is an economic concept that refers to the value of a given amount of money being less in the future. Most people, presented with a choice, would rather have a dollar now than a dollar ten years later, or even one year from now because the dollar can be put to productive use at the moment. When monetary costs and benefits of an action vary over time (e.g., for a capital project, the costs are up-front but the benefits occur over many years), economists adjust for the time value of money by applying an annual discount rate to the amounts in future years. This is different than adjusting for inflation, which is a loss in money's value in the future due to a rise over time in prices for given products and services across the economy. The result of adjusting for the time value of money is known as the "present value." Providing

present values for 2013-2000 for all the economic impact analyses allows for comparison – based on a reasonably lengthy period, and subject to some differences in approach noted in each resource use summary section – of the relative economic impacts of each resource use for each of the field offices and planning units.

The choice of a discount rate is a key analytical decision because, as the discount rate increases, the value of future dollars when "brought back to the present" decreases. Often economists use the discount rates recommended by the federal Office of Management and Budget (OMB) in the OMB Circular A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs." The OMB periodically updates the discount rates for the Circular in "Appendix C: Discount Rates for Cost-Effectiveness, Lease-Purchase, and Related Analyses for OMB Circular No. A-94." The OMB pegs discount rates to interest rates on Treasury notes and bonds of specific maturities corresponding to the planning period for a particular economic analysis. As of the December 2012 edition of Circular A-94 Appendix C, the recommended annual real discount rate (a rate from which any inflation premium has been removed) for a 10-year planning period is 0.1%. This is a very low discount rate compared to discount rates economists have typically used over recent decades. It reflects the fact that interest rates on Treasury notes and bonds are at present extremely low, historically speaking. Therefore, the BLM has chosen to use a more historically typical annual discount rate for this economic impact analysis. The rate used is 3.0%.

Social Impact Analysis

Social impacts may be driven by economic impacts, such as when changes in employment due to management decisions lead to impacts on population, housing, and community services. Other impacts may be more purely social and cultural in nature and can include impacts on quality of life, recreation and amenity values, and traditional land uses and associated cultural values. Social impacts may be marginal or substantial, depending on the degree to which new and revised management actions alter the course set in previous BLM and Forest Service decisions.

Sometimes social impacts can be quantified; however, in this analysis social impacts are described qualitatively. This is because social impacts of BLM and Forest Service management decisions may vary considerably depending on the nature of the community(ies) involved. For a planning effort that covers as large a geographic area as this effort, analysis of social impacts must necessarily use a broad brush.

A key aspect of the social impacts analysis approach is to address impacts based on the varying points of view of key types of stakeholders. The Socioeconomic Baseline Report identifies several broad categories of stakeholders to sage-grouse management decisions in Wyoming. These categories reflect different linkages people have to public lands. They also reflect distinct sets of attitudes, beliefs, values, opinions, and perceptions about public resources and the effects of various management policies and actions. Categorization of stakeholders is not meant to imply that all individuals and social groups fit neatly into a single category; many specific individuals or organizations may have multiple interests and would see themselves reflected in more than one stakeholder category. The point of categorization is to allow differentiation of social impacts based on broad differences in points of view. The social impacts analysis below assesses the alternatives against the different points of view in the broad stakeholder categories.

Environmental Justice Impact Analysis

Definitions and methods for analysis of potential environmental justice (EJ) issues are described in the Socioeconomic Baseline Report. In short, the socioeconomic study area was screened in the report to identify counties with minority and low-income populations that qualify as potential EJ populations based on guidance for EJ analysis from the Council on Environmental Quality. These counties and their potential EJ populations are noted in Chapter 3. Further assessment of the likelihood of impacts to these populations is presented in Section 4.11.7 below.

Non-market Value Impact Analysis

This approach may be used with impacts to market values and is often used with impacts to non-market values. The term non-market values refers to the benefits individuals attribute to experiences of the environment or uses of natural and cultural resources that do not involve market transactions and therefore lack prices. Because these values are not priced, they are difficult to estimate but nonetheless the BLM guidance calls for efforts to be made to identify and assess impacts to nonmarket values in the planning process (BLM Instruction Memorandum No. 2013-131, Guidance on Estimating Non-market Environmental Values, May 31, 2013).

Non-market values associated with recreation are estimated quantitatively for this RMP/EIS using a "benefits transfer" methodology described in Appendix N, Technical Report: Social and Economic Impact Analysis Methodology. Because of uncertainties inherent in quantification of non-market values, the analysis is conducted at the planning level only, and only for Alternative A. Potential differences between the alternatives in the non-market values associated with recreation are described qualitatively. Other non-market values are described qualitatively for all the alternatives.

4.11.4 Summaries of the Quantitative Economic Impact Analysis Results

This section presents a series of tables, and associated discussions, for the economic impacts that were estimated with the IMPLAN model, and additional estimates of tax and mineral revenues. Readers should keep in mind that the figures from the IMPLAN model and the revenue analysis *only* represent the quantifiable economic benefits (economic output, labor earnings, employment, and certain government revenues) of each alternative. Additional, non-modeled economic benefits exist. Many of these additional benefits are discussed qualitatively in later sections that address each alternative.

Also, there are many economic and social costs that are not encompassed in the IMPLAN analysis and therefore are not reflected when the economic numbers below for one alternative are compared to those for another alternative. For instance, it is highly likely that Alternative A has higher social and environmental costs than Alternative C due to the much higher amount of oil and gas development under Alternative A. Oil and gas development necessarily has environmental costs, and high rates of oil and gas development can result in social costs such as reductions in community cohesiveness, increases in crime, and other impacts to quality of life. However, these externalities (costs not directly reflected in a particular market transaction such as an investment in developing an oil well) are difficult to quantify and are not estimated in this study. Some are addressed qualitatively in other parts of this socioeconomic impacts analysis.

The resource uses for which the IMPLAN results are summarized in this subsection are:

- Oil and gas development and production
- Wind energy development and production
- Livestock grazing
- Recreation

Oil and Gas Development and Production

This section presents the results of the economic impact analysis for oil and gas development and production, based on the IMPLAN model and additional estimates of revenue impacts. The impacts for oil and gas *development* are presented first, in a summary table for the state, followed by a summary table for each BLM field office and Forest Service planning unit. Impacts for oil and gas production follow, again in a summary table for the state, followed by a summary table for each field office and planning unit. A

brief discussion for each table highlights the key findings in the table, and makes some comparisons between the alternatives and among the field offices and planning units.

It is very important for readers to note that the results presented here only address *new* oil and gas wells on federal mineral estate within the sage-grouse core/priority habitat, general habitat, and connectivity habitat areas. The economic figures presented below for the new oil and gas wells are a subset of the economic impacts of all oil and gas wells (new and existing) on federal mineral estate in each field office and planning unit, which in turn are a subset of the economic impacts of all oil and gas wells on all federal and non-federal mineral estate in each field office and planning unit (i.e., including wells on privately and state-owned mineral estate). Put another way, the figures below do *not* include the economic impacts of any wells (new and existing) on federal mineral estate outside of sage-grouse habitat areas,[1] nor of any wells (new and existing) on non-federal mineral estate. Nor do the figures include the economic impacts of production from *existing* wells on federal mineral estate within sage-grouse habitat areas; this existing production is not affected by the management decisions of this planning action.[2]

Likewise, the percentage differences for Alternatives B, C, and D, and the Proposed LUP Amendments in comparison to Alternative A as shown below only represent changes for new wells on federal mineral estate in habitat areas. They do *not* represent the percentage change to *total* economic activity resulting from all oil and gas development and production. The percentage change to total oil- and gas-related economic activity would be smaller because while the absolute difference in dollars or jobs would be as shown in the tables below, the base for comparison, all oil and gas-related economic activity, would be larger. This is so because it would include the contributions of existing wells on federal mineral estate within sage-grouse habitat areas, of wells on federal mineral estate outside of sage-grouse habitat areas, and of wells on non-federal mineral estate.

Economic Impacts of Oil and Gas Development

Table 4-44 summarizes the economic analysis at the statewide level for oil and gas development based on implementation of the alternatives across the planning area. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas would generate $23,284 million (in present value and 2011 dollars) in direct economic output for the state economy in the period from 2013 to 2020, and $31,435 million in total economic output. This economic activity would include $12,672 million in labor earnings, and support an average of 27,492 jobs per year. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 10% to 11% based on the reductions in oil and gas development that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 25% to 26%. If Alternative D were implemented, the economic indicators would decrease by 4%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 8%.

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[1] *In some of the field offices and planning units, sage-grouse habitat covers most of the office/unit. In these cases, the economic analysis encompasses most if not all of the new wells on federal mineral estate projected for each alternative.*

[2] *Any restrictions resulting from this planning action would only be applied to new leases (i.e., currently unleased areas). Production rates from existing wells in already leased areas would not be affected. With respect to new wells within already leased areas, these wells may be affected by this planning action. Action # 57 provides that the BLM will consider inclusion of stipulations to protect sage-grouse or their habitats as permit COAs, where adequately protective stipulations are not already in place. Whether COAs will be placed on new wells in already leased areas, and to what extent COAs would impact economic activity, was not estimated; therefore, the economic impacts of Action # 57, if any, are not included in the quantitative economic impact analysis.*

Table 4-44. Economic Impacts of Oil and Gas Development for Wyoming through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$23,184,244	$20,755,032	$17,412,737	$22,320,544	$21,379,414
% Difference from Alt. A	N.A.	-10.5%	-24.9%	-3.7%	-7.8%
Total Economic Output	$31,434,869	$27,977,575	$23,386,886	$30,267,706	$28,909,331
% Difference from Alt. A	N.A.	-11.0%	-25.6%	-3.7%	-8.0%
Total Labor Earnings	$12,672,188	$11,294,736	$9,460,364	$12,201,274	$11,667,185
% Difference from Alt. A	N.A.	-10.9%	-25.3%	-3.7%	-7.9%
Average Total Jobs Per Year	27,491.6	24,401.5	20,308.3	26,471.5	25,268.1
% Difference from Alt. A	N.A.	-11.2%	-26.1%	-3.7%	-8.1%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-45 summarizes the economic analysis for oil and gas development for the Casper Field Office. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this field office would generate $2,497 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Converse, Goshen, Natrona, and Platte Counties) in the period from 2013 to 2020, and $3,746 million in total economic output. This economic activity would include $1,568 million in labor earnings, and support an average of 3,327 jobs per year. Of all the field offices and planning units, the Casper Field Office has the third highest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 37% based on the reductions in oil and gas development that are projected in the RFD. This is the largest percentage decrease among all the field offices and planning units for Alternative B. If Alternative C were implemented, the economic indicators would decrease by 49%. This is the third largest percentage decrease among all the field offices and planning units for this alternative. If Alternative D were implemented, the economic indicators would decrease by 6%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 20%, which is also the largest percentage decrease among all the field offices and planning units for this alternative.

Table 4-45. Economic Impacts of Oil and Gas Development for the Casper Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$2,497,055	$1,573,571	$1,273,147	$2,354,557	$1,998,727
% Difference from Alt. A	N.A.	-37.0%	-49.0%	-5.7%	-20.0%

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Total Economic Output	$3,745,943	$2,361,837	$1,910,589	$3,532,410	$2,999,007
% Difference from Alt. A	N.A.	-36.9%	-49.0%	-5.7%	-19.9%
Total Labor Earnings	$1,567,516	$988,621	$799,690	$1,478,216	$1,255,103
% Difference from Alt. A	N.A.	-36.9%	-49.0%	-5.7%	-19.9%
Average Total Jobs Per Year	3,327.1	2,109.6	1,711.7	3,135.2	2,672.4
% Difference from Alt. A	N.A.	-36.6%	-48.6%	-5.8%	-19.7%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-46 summarizes the economic analysis for oil and gas development for the Kemmerer Field Office. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this field office would generate $1,168 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Lincoln, Sweetwater, and Uinta Counties) in the period from 2013 to 2020, and $1,537 million in total economic output. This economic activity would include $610 million in labor earnings, and support an average of 1,398 jobs per year. Of all the field offices and planning units, the Kemmerer Field Office has the fifth highest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 16% based on the reductions in oil and gas development that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 31% to 32%. If Alternative D were implemented, the economic indicators would decrease by 2%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 8%.

Table 4-46. Economic Impacts of Oil and Gas Development for the Kemmerer Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,168,132	$983,885	$796,236	$1,149,806	$1,068,918
% Difference from Alt. A	N.A.	-15.8%	-31.8%	-1.6%	-8.5%
Total Economic Output	$1,536,758	$1,294,928	$1,048,597	$1,512,678	$1,406,417
% Difference from Alt. A	N.A.	-15.7%	-31.8%	-1.6%	-8.5%
Total Labor Earnings	$610,360	$515,443	$418,858	$600,848	$558,932
% Difference from Alt. A	N.A.	-15.6%	-31.4%	-1.6%	-8.4%
Average Total Jobs Per Year	1,397.7	1,173.8	944.8	1,375.5	1,280.4
% Difference from Alt. A	N.A.	-16.0%	-32.4%	-1.6%	-8.4%

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-47 summarizes the economic analysis for oil and gas development for the Newcastle Field Office. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this field office would generate $174 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Campbell, Crook, Niobrara, and Weston Counties) in the period from 2013 to 2020, and $233 million in total economic output. This economic activity would include $85 million in labor earnings, and support an average of 199 jobs per year. Of all the field offices and planning units, the Newcastle Field Office has the lowest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 17% based on the reductions in oil and gas development that are projected in the RFD. This is the second largest percentage decrease among all the field offices and planning units for this alternative. If Alternative C were implemented, the economic indicators would decrease by 45% to 46%. If Alternative D were implemented, the economic indicators would decrease by 6%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 7%.

Table 4-47. Economic Impacts of Oil and Gas Development for the Newcastle Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$174,094	$144,415	$96,185	$164,600	$162,229
% Difference from Alt. A	N.A.	-17.0%	-44.8%	-5.5%	-6.8%
Total Economic Output	$233,439	$193,664	$129,003	$220,715	$217,618
% Difference from Alt. A	N.A.	-17.0%	-44.7%	-5.5%	-6.8%
Total Labor Earnings	$84,977	$70,492	$46,909	$80,346	$79,309
% Difference from Alt. A	N.A.	-17.0%	-44.8%	-5.5%	-6.7%
Average Total Jobs Per Year	198.6	164.1	107.0	187.5	185.0
% Difference from Alt. A	N.A.	-17.4%	-46.1%	-5.6%	-6.9%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-48 summarizes the economic analysis for oil and gas development for the Pinedale Field Office. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this field office would generate $14,228 million (in present value and 2011 dollars) in direct economic output

for the economy of the socioeconomic study area for this field office (defined as Lincoln, Sublette and Sweetwater Counties) in the period from 2013 to 2020, and $17,835 million in total economic output. This economic activity would include $7,446 million in labor earnings, and support an average of 15,413 jobs per year. Of all the field offices and planning units, the Pinedale Field Office has by far the highest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 4% based on the reductions in oil and gas development that are projected in the RFD. This is the second lowest decrease among all the field offices and planning units. If Alternative C were implemented, the economic indicators would decrease by 13%, the lowest decrease among all the offices/units. If Alternative D were implemented, the economic indicators would decrease by 4%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 5%.

Table 4-48. Economic Impacts of Oil and Gas Development for the Pinedale Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$14,228,180	$13,703,430	$12,328,808	$13,616,422	$13,556,841
% Difference from Alt. A	N.A.	-3.7%	-13.3%	-4.3%	-4.7%
Total Economic Output	$17,834,786	$17,180,678	$15,457,666	$17,070,121	$16,995,647
% Difference from Alt. A	N.A.	-3.7%	-13.3%	-4.3%	-4.7%
Total Labor Earnings	$7,445,681	$7,178,158	$6,459,764	$7,129,498	$7,098,868
% Difference from Alt. A	N.A.	-3.6%	-13.2%	-4.2%	-4.7%
Average Total Jobs Per Year	15,413.5	14,847.9	13,346.6	14,750.7	14,683.1
% Difference from Alt. A	N.A.	-3.7%	-13.4%	-4.3%	-4.7%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-49 summarizes the economic analysis for oil and gas development for the Rawlins Field Office. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this field office would generate $2,920 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Albany, Carbon, Laramie, and Sweetwater Counties) in the period from 2013 to 2020, and $4,149 million in total economic output. This economic activity would include $1,575 million in labor earnings, and support an average of 3,864 jobs per year. Of all the field offices and planning units, the Rawlins Field Office has the second highest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 14% based on the reductions in oil and gas development that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 43%. If Alternative D were

implemented, the economic indicators would decrease by 1%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 8%.

Table 4-49. Economic Impacts of Oil and Gas Development for the Rawlins Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$2,919,864	$2,512,088	$1,652,692	$2,877,789	$2,694,055
% Difference from Alt. A	N.A.	-14.0%	-43.4%	-1.4%	-7.7%
Total Economic Output	$4,148,521	$3,571,437	$2,347,984	$4,089,021	$3,828,545
% Difference from Alt. A	N.A.	-13.9%	-43.4%	-1.4%	-7.7%
Total Labor Earnings	$1,575,075	$1,359,982	$891,175	$1,552,971	$1,455,056
% Difference from Alt. A	N.A.	-13.7%	-43.4%	-1.4%	-7.6%
Average Total Jobs Per Year	3,863.5	3,311.5	2,176.7	3,805.4	3,555.9
% Difference from Alt. A	N.A.	-14.3%	-43.7%	-1.5%	-8.0%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-50 summarizes the economic analysis for oil and gas development for the Rock Springs Field Office. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this field office would generate $1,571 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Fremont, Lincoln, Sublette, Sweetwater, and Uinta counties) in the period from 2013 to 2020, and $2,071 million in total economic output. This economic activity would include $822 million in labor earnings, and support an average of 1,910 jobs per year. Of all the field offices and planning units, the Rock Springs Field Office has the fourth highest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 22% based on the reductions in oil and gas development that are projected in the RFD. This is the second largest decrease among all the field offices and planning units for this alternative. If Alternative C were implemented, the economic indicators would decrease by 29%. If Alternative D were implemented, the economic indicators would decrease by 2%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 8%.

Table 4-50. Economic Impacts of Oil and Gas Development for the Rock Springs Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,571,410	$1,223,431	$1,121,388	$1,533,869	$1,449,266

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	-22.1%	-28.6%	-2.4%	-7.8%
Total Economic Output	$2,070,512	$1,612,593	$1,477,953	$2,021,157	$1,910,103
% Difference from Alt. A	N.A.	-22.1%	-28.6%	-2.4%	-7.7%
Total Labor Earnings	$822,380	$641,066	$587,410	$802,878	$759,155
% Difference from Alt. A	N.A.	-22.0%	-28.6%	-2.4%	-7.7%
Average Total Jobs Per Year	1,907.8	1,479.9	1,350.8	1,861.0	1,755.9
% Difference from Alt. A	N.A.	-22.4%	-29.2%	-2.5%	-8.0%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-51 summarizes the economic analysis for oil and gas development for the Bridger-Teton National Forest. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this planning unit would generate $444 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this planning unit (defined as Fremont, Lincoln, Sublette, and Teton Counties) in the period from 2013 to 2020, and $573 million in total economic output. This economic activity would include $244 million in labor earnings, and support an average of 533 jobs per year. Of all the field offices and planning units, the BTNF has the sixth highest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would increase by 3% based on the reductions in oil and gas development that are projected in the RFD. This slight increase probably reflects rounding error at some point in the many calculations used in this analysis. In any case, of all the field offices and planning units, this planning unit would experience the least amount of change under Alternative B compared to Alternative A. If Alternative C were implemented, the economic indicators would decrease by 84%. This is the largest percentage decrease among all the field offices and planning units for this alternative. If Alternative D were implemented, the economic indicators would increase by 1%. If the Proposed LUP Amendments were implemented, the economic indicators would increase by 1%.

Table 4-51. Economic Impacts of Oil and Gas Development for the Bridger-Teton National Forest through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$444,341	$455,823	$68,972	$449,082	$449,378
% Difference from Alt. A	N.A.	2.6%	-84.5%	1.1%	1.1%
Total Economic Output	$573,340	$588,287	$89,027	$579,549	$579,936
% Difference from Alt. A	N.A.	2.6%	-84.5%	1.1%	1.2%

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Total Labor Earnings	$243,815	$250,229	$37,905	$246,520	$246,689
% Difference from Alt. A	N.A.	2.6%	-84.5%	1.1%	1.2%
Average Total Jobs Per Year	532.7	547.6	84.9	539.0	539.4
% Difference from Alt. A	N.A.	2.8%	-84.1%	1.2%	1.2%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

According to the RFD, no oil or gas wells will be drilled on federal mineral estate in the Medicine Bow National Forest within the analysis period. Therefore, there are no oil and gas development economic impacts to report for this planning unit.

Table 4-52 summarizes the economic analysis for oil and gas development for the TBNG. Under Alternative A, oil and gas development on federal mineral estate in sage-grouse habitat areas in this planning unit would generate $181 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this planning unit (defined as Campbell, Converse, Crook, Niobrara, and Weston Counties) in the period from 2013 to 2020, and $240 million in total economic output. This economic activity would include $89 million in labor earnings, and support an average of 204 jobs per year. Of all the field offices and planning units, the TBNG has the second lowest total economic output from oil and gas development under Alternative A. Annual economic impacts would vary each year according to the number of wells drilled each year, per the RFD.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 12% to 13% based on the reductions in oil and gas development that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 58% to 61%. This is the second largest percentage decrease among all the field offices and planning units for this alternative. If Alternative D were implemented, the economic indicators would decrease by 4%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 8% to 9%.

Table 4-52. Economic Impacts of Oil and Gas Development for the Thunder Basin National Grassland through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$181,166	$158,390	$75,310	$174,417	$166,096
% Difference from Alt. A	N.A.	-12.6%	-58.4%	-3.7%	-8.3%
Total Economic Output	$239,828	$209,760	$99,746	$230,898	$219,901
% Difference from Alt. A	N.A.	-12.5%	-58.4%	-3.7%	-8.3%
Total Labor Earnings	$89,297	$78,214	$37,182	$85,986	$81,914
% Difference from Alt. A	N.A.	-12.4%	-58.4%	-3.7%	-8.3%

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Average Total Jobs Per Year	204.0	176.9	80.4	195.8	185.8
% Difference from Alt. A	N.A.	-13.2%	-60.6%	-4.0%	-8.9%

N.A.: Not Applicable
All figures are for wells on federal mineral estate only.
Analysis incorporates variations in wells drilled and wells completed by year according to the RFD and the BLM RMG.
All dollar figures are present values based on a 3% annual real discount rate.

Economic Impacts of Oil and Gas Production

Table 4-53 summarizes the economic analysis at the statewide level for oil and gas production based on implementation of the alternatives across the planning area. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $25,828 million (in present value and 2011 dollars) in direct economic output for the state economy in the period from 2013 to 2020, and $29,266 million in total economic output. This economic activity would include $1,944 million in labor earnings, and support 5,700 jobs in 2020, the last year for which economic impacts were projected.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $1,249 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $1,201 million in severance taxes, and $1,576 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 4% to 6% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 18% to 22%. If Alternative D were implemented, the economic indicators would decrease by 2%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 3% to 4%.

Table 4-53. Economic Impacts of Oil and Gas Production for Wyoming through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$25,828,281	$24,924,123	$21,170,674	$25,422,413	$25,005,503
% Difference from Alt. A	N.A.	-3.5%	-18.0%	-1.6%	-3.2%
Total Economic Output	$29,265,971	$28,208,044	$23,922,706	$28,805,863	$28,319,313
% Difference from Alt. A	N.A.	-3.6%	-18.3%	-1.6%	-3.2%
Total Labor Earnings	$1,944,081	$1,832,372	$1,527,046	$1,911,451	$1,861,946
% Difference from Alt. A	N.A.	-5.7%	-21.5%	-1.7%	-4.2%
Total Jobs in 2020	5,699.5	5,268.0	4,189.9	5,542.3	5,372.6

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	-5.9%	-22.0%	-1.7%	-4.3%
Ad Valorem Taxes	$1,249,334	$1,202,024	$1,019,020	$1,229,374	$1,207,871
% Difference from Alt. A	N.A.	-3.8%	-18.4%	-1.6%	-3.3%
Severance Taxes	$1,200,913	$1,156,253	$980,673	$1,181,802	$1,161,437
% Difference from Alt. A	N.A.	-3.7%	-18.3%	-1.6%	-3.3%
FMR	$1,576,170	$1,521,327	$1,293,374	$1,551,343	$1,525,987
% Difference from Alt. A	N.A.	-3.5%	-17.9%	-1.6%	-3.2%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-54 summarizes the economic analysis for oil and gas production for the Casper Field Office. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this field office would generate $2,497 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Converse, Goshen, Natrona, and Platte Counties) in the period from 2013 to 2020, and $3,746 million in total economic output. This economic activity would include $1,944 million in labor earnings, and support 5,700 jobs in 2020, the last year for which economic impacts were projected. Of all the field offices and planning units, the Casper Field Office has the third highest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $75 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $70 million in severance taxes, and $81 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 32% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. This is the largest percentage decrease among all the field offices and planning units for Alternative B. If Alternative C were implemented, the economic indicators would decrease by 46%, the third largest percentage decrease among all the offices/units for this alternative. If Alternative D were implemented, the economic indicators would decrease by 4%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 18%, the largest percentage decrease among all the offices/units for this alternative.

Table 4-54. Economic Impacts of Oil and Gas Production for the Casper Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,354,491	$916,796	$728,933	$1,297,499	$1,112,117
% Difference from Alt. A	N.A.	-32.3%	-46.2%	-4.2%	-17.9%
Total Economic Output	$1,559,359	$1,055,462	$839,185	$1,493,747	$1,280,326
% Difference from Alt. A	N.A.	-32.3%	-46.2%	-4.2%	-17.9%
Total Labor Earnings	$190,241	$128,766	$102,380	$182,236	$156,199
% Difference from Alt. A	N.A.	-32.3%	-46.2%	-4.2%	-17.9%
Total Jobs in 2020	571.7	408.8	329.0	541.7	483.2
% Difference from Alt. A	N.A.	-32.3%	-46.0%	-4.3%	-17.8%
Ad Valorem Taxes	$75,483	$51,059	$40,575	$72,305	$61,964
% Difference from Alt. A	N.A.	-32.4%	-46.2%	-4.2%	-17.9%
Severance Taxes	$70,280	$47,546	$37,788	$67,322	$57,695
% Difference from Alt. A	N.A.	-32.3%	-46.2%	-4.2%	-17.9%
FMR	$81,269	$55,008	$43,736	$77,850	$66,727
% Difference from Alt. A	N.A.	-32.3%	-46.2%	-4.2%	-17.9%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-55 summarizes the economic analysis for oil and gas production for the Kemmerer Field Office. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this field office would generate $1,034 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Lincoln, Sweetwater, and Uinta Counties) in the period from 2013 to 2020, and $1,185 million in total economic output. This economic activity would include $117 million in labor earnings, and support 399 jobs in 2020, the last year for which economic impacts were projected. Of all the field offices and planning units, the Kemmerer Field Office has the fourth highest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $49 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $48 million in severance taxes, and $62 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 11% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 25%. If Alternative D were implemented, the economic indicators would decrease by 4%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 1% to 2%.

Table 4-55. Economic Impacts of Oil and Gas Production for the Kemmerer Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,034,011	$920,733	$777,479	$1,019,065	$955,952
% Difference from Alt. A	N.A.	-11.0%	-24.8%	-1.4%	-7.5%
Total Economic Output	$1,185,471	$1,055,600	$891,363	$1,168,335	$1,095,978
% Difference from Alt. A	N.A.	-11.0%	-24.8%	-1.4%	-7.5%
Total Labor Earnings	$116,556	$103,787	$87,639	$114,872	$107,757
% Difference from Alt. A	N.A.	-11.0%	-24.8%	-1.4%	-7.5%
Total Jobs in 2020	399.0	345.6	289.8	394.2	373.6
% Difference from Alt. A	N.A.	-11.1%	-25.0%	-1.4%	-7.5%
Ad Valorem Taxes	$49,234	$43,841	$37,020	$48,522	$45,517
% Difference from Alt. A	N.A.	-11.0%	-24.8%	-1.4%	-7.5%
Severance Taxes	$47,504	$42,300	$35,720	$46,818	$43,918
% Difference from Alt. A	N.A.	-11.0%	-24.8%	-1.4%	-7.5%
FMR	$62,041	$55,244	$46,649	$61,144	$57,357
% Difference from Alt. A	N.A.	-11.0%	-24.8%	-1.4%	-7.5%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-56 summarizes the economic analysis for oil and gas production for the Newcastle Field Office. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this field office would generate $170 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Crook, Weston, Niobrara and Campbell Counties) in the period from 2013 to 2020, and $191 million in total economic output. This economic activity would include $18 million in labor earnings, and support 45 jobs in 2020, the last year

for which economic impacts were projected. Of all the field offices and planning units, the Newcastle Field Office has the second lowest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $10 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $9 million in severance taxes, and $10 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 15% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 38% to 39%. If Alternative D were implemented, the economic indicators would decrease by 4%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 1% to 2%.

Table 4-56. Economic Impacts of Oil and Gas Production for the Newcastle Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$169,881	$144,940	$105,161	$162,339	$172,594
% Difference from Alt. A	N.A.	-14.7%	-38.1%	-4.4%	1.6%
Total Economic Output	$191,158	$163,093	$118,332	$182,671	$194,210
% Difference from Alt. A	N.A.	-14.7%	-38.1%	-4.4%	1.6%
Total Labor Earnings	$17,534	$14,960	$10,854	$16,756	$17,814
% Difference from Alt. A	N.A.	-14.7%	-38.1%	-4.4%	1.6%
Total Jobs in 2020	45.3	37.6	20.9	42.6	44.5
% Difference from Alt. A	N.A.	-14.9%	-38.9%	-4.5%	1.4%
Ad Valorem Taxes	$9,521	$8,124	$5,896	$9,098	$9,673
% Difference from Alt. A	N.A.	-14.7%	-38.1%	-4.4%	1.6%
Severance Taxes	$8,854	$7,555	$5,482	$8,461	$8,996
% Difference from Alt. A	N.A.	-14.7%	-38.1%	-4.4%	1.6%
FMR	$10,193	$8,696	$6,310	$9,740	$10,356
% Difference from Alt. A	N.A.	-14.7%	-38.1%	-4.4%	1.6%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments

All dollar figures are present values based on a 3% annual real discount rate.

Table 4-57 summarizes the economic analysis for oil and gas production for the Pinedale Field Office. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this field office would generate $18,620 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Lincoln, Sublette, and Sweetwater Counties) in the period from 2013 to 2020, and $20,264 million in total economic output. This economic activity would include $1,075 million in labor earnings, and support 2,651 jobs in 2020, the last year for which economic impacts were projected. Of all the field offices and planning units, the Pinedale Field Office has by far the highest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $888 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $856 million in severance taxes, and $1,117 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 1% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. This is the lowest percentage decrease among all the field offices and planning units for Alternative B. If Alternative C were implemented, the economic indicators would decrease by 9%, the lowest percentage decrease among all the offices/units for this alternative. If Alternative D were implemented, the economic indicators would decrease by 2%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 2%.

Table 4-57. Economic Impacts of Oil and Gas Production for the Pinedale Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$18,620,337	$18,721,226	$16,895,546	$18,319,570	$18,284,862
% Difference from Alt. A	N.A.	0.5%	-9.3%	-1.6%	-1.8%
Total Economic Output	$20,264,134	$20,373,930	$18,387,080	$19,936,816	$19,899,044
% Difference from Alt. A	N.A.	0.5%	-9.3%	-1.6%	-1.8%
Total Labor Earnings	$1,074,990	$1,080,815	$975,415	$1,057,626	$1,055,623
% Difference from Alt. A	N.A.	0.5%	-9.3%	-1.6%	-1.8%
Total Jobs in 2020	2,650.5	2,609.1	2,351.4	2,558.7	2,549.1
% Difference from Alt. A	N.A.	0.5%	-9.4%	-1.7%	-1.9%
Ad Valorem Taxes	$887,739	$892,549	$805,510	$873,399	$871,744

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	0.5%	-9.3%	-1.6%	-1.8%
Severance Taxes	$856,289	$860,929	$776,973	$842,457	$840,861
% Difference from Alt. A	N.A.	0.5%	-9.3%	-1.6%	-1.8%
FMR	$1,117,220	$1,123,274	$1,013,733	$1,099,174	$1,097,092
% Difference from Alt. A	N.A.	0.5%	-9.3%	-1.6%	-1.8%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-58 summarizes the economic analysis for oil and gas production for the Rawlins Field Office. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this field office would generate $2,836 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Carbon, Albany, Laramie, and Sweetwater Counties Counties) in the period from 2013 to 2020, and $3,294 million in total economic output. This economic activity would include $273 million in labor earnings, and support 1,067 jobs in 2020, the last year for which economic impacts were projected. Of all the field offices and planning units, the Rawlins Field Office has the second largest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $139 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $133 million in severance taxes, and $170 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 9% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 42%. If Alternative D were implemented, the economic indicators would decrease by 1%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 5%.

Table 4-58. Economic Impacts of Oil and Gas Production for the Rawlins Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$2,836,024	$2,572,608	$1,644,635	$2,817,057	$2,697,022

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	-9.3%	-42.0%	-0.7%	-4.9%
Total Economic Output	$3,294,306	$2,988,324	$1,910,396	$3,272,274	$3,132,842
% Difference from Alt. A	N.A.	-9.3%	-42.0%	-0.7%	-4.9%
Total Labor Earnings	$273,419	$248,023	$158,558	$271,591	$260,018
% Difference from Alt. A	N.A.	-9.3%	-42.0%	-0.7%	-4.9%
Total Jobs in 2020	1,066.9	974.4	585.3	1,056.8	996.8
% Difference from Alt. A	N.A.	-9.2%	-42.2%	-0.7%	-5.0%
Ad Valorem Taxes	$138,740	$125,863	$80,455	$137,813	$131,943
% Difference from Alt. A	N.A.	-9.3%	-42.0%	-0.7%	-4.9%
Severance Taxes	$133,006	$120,659	$77,131	$132,118	$126,490
% Difference from Alt. A	N.A.	-9.3%	-42.0%	-0.7%	-4.9%
FMR	$170,161	$154,356	$98,678	$169,023	$161,821
% Difference from Alt. A	N.A.	-9.3%	-42.0%	-0.7%	-4.9%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-59 summarizes the economic analysis for oil and gas production for the Rock Springs Field Office. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this field office would generate $1,039 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this field office (defined as Sweetwater, Uinta, Lincoln, Sublette, and Fremont Counties) in the period from 2013 to 2020, and $1,157 million in total economic output. This economic activity would include $68 million in labor earnings, and support 263 jobs in 2020, the last year for which economic impacts were projected. Of all the field offices and planning units, the Rock Springs Field Office has the fifth largest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $49 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $48 million in severance taxes, and $63 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 16% to 17% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 23%. If Alternative D were implemented, the economic indicators would decrease by 1%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 3%.

Table 4-59. Economic Impacts of Oil and Gas Production for the Rock Springs Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,038,674	$868,216	$800,524	$1,026,111	$1,011,431
% Difference from Alt. A	N.A.	-16.4%	-22.9%	-1.2%	-2.6%
Total Economic Output	$1,157,489	$967,532	$892,096	$1,143,488	$1,127,129
% Difference from Alt. A	N.A.	-16.4%	-22.9%	-1.2%	-2.6%
Total Labor Earnings	$68,300	$57,091	$52,640	$67,474	$66,509
% Difference from Alt. A	N.A.	-16.4%	-22.9%	-1.2%	-2.6%
Total Jobs in 2020	263.1	208.6	184.8	257.1	245.7
% Difference from Alt. A	N.A.	-16.8%	-23.5%	-1.3%	-2.9%
Ad Valorem Taxes	$49,357	$41,257	$38,040	$48,760	$48,063
% Difference from Alt. A	N.A.	-16.4%	-22.9%	-1.2%	-2.6%
Severance Taxes	$47,646	$39,827	$36,722	$47,070	$46,397
% Difference from Alt. A	N.A.	-16.4%	-22.9%	-1.2%	-2.6%
FMR	$62,320	$52,093	$48,031	$61,567	$60,686
% Difference from Alt. A	N.A.	-16.4%	-22.9%	-1.2%	-2.6%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-60 summarizes the economic analysis for oil and gas production for the BTNF. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this planning unit would generate $434 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this planning unit (defined as Fremont, Lincoln, Sublette, and Teton Counties) in the period from 2013 to 2020, and $482 million in total economic output. This economic activity would include $29 million in labor earnings, and support 184 jobs in 2020, the last year for which economic impacts were projected. Of all the field offices and planning units, the BTNF has sixth largest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $21 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $20 million in severance taxes, and $26 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 6% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 87%. This is the largest percentage decrease among all the field offices and planning units for this alternative. If Alternative D were implemented, the economic indicators would decrease by 4%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 4%.

Table 4-60. Economic Impacts of Oil and Gas Production for the Bridger-Teton National Forest (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$434,236	$461,537	$55,768	$449,568	$450,527
% Difference from Alt. A	N.A.	6.3%	-87.2%	3.5%	3.8%
Total Economic Output	$481,530	$511,805	$61,842	$498,533	$499,595
% Difference from Alt. A	N.A.	6.3%	-87.2%	3.5%	3.8%
Total Labor Earnings	$29,368	$31,215	$3,772	$30,405	$30,470
% Difference from Alt. A	N.A.	6.3%	-87.2%	3.5%	3.8%
Total Jobs in 2020	183.7	195.2	43.2	190.2	190.6
% Difference from Alt. A	N.A.	6.3%	-86.9%	3.5%	3.8%
Ad Valorem Taxes	$20,704	$22,006	$2,659	$21,435	$21,481
% Difference from Alt. A	N.A.	6.3%	-87.2%	3.5%	3.8%
Severance Taxes	$19,970	$21,226	$2,565	$20,675	$20,719
% Difference from Alt. A	N.A.	6.3%	-87.2%	3.5%	3.8%
FMR	$26,054	$27,692	$3,346	$26,974	$27,032
% Difference from Alt. A	N.A.	6.3%	-87.2%	3.5%	3.8%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

According to the RFD, no oil or gas wells will be drilled on federal mineral estate in the MBNF within the analysis period. Therefore, there are no oil and gas production economic impacts to report for this planning unit.

Table 4-61 summarizes the economic analysis for oil and gas production for the TBNG. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas in this planning unit would generate $341 million (in present value and 2011 dollars) in direct economic output for the economy of the socioeconomic study area for this planning unit (defined as Campbell, Converse, Crook, Niobrara, and Weston Counties) in the period from 2013 to 2020, and $374 million in total economic output. This economic activity would include $26 million in labor earnings, and support 46 jobs in 2020, the last year for which economic impacts were projected. Of all the field offices and planning units, the TBNG has the second lowest total economic output from oil and gas production under Alternative A.

Oil and gas production would also generate tax and royalty revenues. Under Alternative A, oil and gas production on federal mineral estate in sage-grouse habitat areas would generate $19 million in ad valorem taxes (in present value and 2011 dollars) in the period from 2013 to 2020, $18 million in severance taxes, and $20 million in federal mineral royalties that accrue to the State of Wyoming (plus a roughly similar amount that accrues to the Federal Government).

Annual economic impacts would increase each year as the number of wells in production increases, per the RFD. Tax revenues would also increase each year for the same reason.

Compared to Alternative A, if Alternative B were implemented, the economic indicators noted above would decrease by 7% based on the reductions in oil and gas development – and thus resulting reductions in production – that are projected in the RFD. If Alternative C were implemented, the economic indicators would decrease by 52%, the second largest percentage decrease among all the field offices and planning units for this alternative. If Alternative D were implemented, the economic indicators would decrease by 3%. If the Proposed LUP Amendments were implemented, the economic indicators would decrease by 6%.

Table 4-61. Economic Impacts of Oil and Gas Production for the Thunder Basin National Grassland (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$340,627	$318,067	$162,628	$331,203	$320,999
% Difference from Alt. A	N.A.	-6.6%	-52.3%	-2.8%	-5.8%
Total Economic Output	$374,455	$349,655	$178,779	$364,096	$352,878
% Difference from Alt. A	N.A.	-6.6%	-52.3%	-2.8%	-5.8%
Total Labor Earnings	$26,346	$24,601	$12,579	$25,617	$24,828
% Difference from Alt. A	N.A.	-6.6%	-52.3%	-2.8%	-5.8%
Total Jobs in 2020	46.5	35.7	6.1	42.7	38.2
% Difference from Alt. A	N.A.	-7.3%	-54.1%	-3.0%	-6.3%
Ad Valorem Taxes	$18,557	$17,326	$8,865	$18,042	$17,486
% Difference from Alt. A	N.A.	-6.6%	-52.2%	-2.8%	-5.8%
Severance Taxes	$17,362	$16,211	$8,293	$16,881	$16,360

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	-6.6%	-52.2%	-2.8%	-5.8%
FMR	$20,438	$19,084	$9,758	$19,872	$19,260
% Difference from Alt. A	N.A.	-6.6%	-52.3%	-2.8%	-5.8%

N.A.: Not Applicable
FMR: Federal Mineral Royalties (portion accruing to the State of Wyoming)
All figures are for wells on federal mineral estate only.
Analysis incorporates estimated growth in annual production. Estimates are based on a) increasing numbers of wells in operation each year, b) average per well production decline curves over time, c) estimated average co-production rates (oil from gas wells, gas from oil wells), all as provided by the BLM RMG.
Tax and FMR figures are based on the estimated sales value of oil and gas production.
All dollar figures are present values based on a 3% annual real discount rate.

Wind Energy Development and Production

The analysis of the economic impacts of wind energy development and production utilizes two development scenarios. Many wind energy projects are currently being planned or contemplated in Wyoming, including on federal public lands. However, it is not clear how many of these projects will be approved, and how many will be built. Much will depend on energy market conditions, and also on the availability of adequate transmission line capacity to move electricity generated in Wyoming to markets in other states. Because of these uncertainties, a high development scenario and a low development scenario were prepared and analyzed. The methodology and assumptions used in developing these scenarios are provided in Appendix N, Technical Report: Social and Economic Impact Analysis Methodology.

Economic Impacts of Wind Energy Development

Table 4-62 and Table 4-63 summarize the economic analysis at the statewide level for wind energy *development* based on implementation of the alternatives across the planning area. Under Alternative A, in the low development scenario, wind energy development on available BLM-administered lands and National Forest System lands in the planning area would generate $239 million in direct economic output (in present value and 2011 dollars) for the state economy in the period from 2013 to 2020, and $339 million in total economic output. This economic activity would include $147 million in labor earnings, and support an average of 422 jobs per year. In the high development scenario, wind energy development would generate $597 million in direct economic output and $849 million in total economic output; this economic activity would include $368 million in labor earnings, and support an average of 1,054 jobs per year.

Wind energy development would also generate tax revenues. Under Alternative A, wind energy development in the planning area would generate $69 million (in present value and 2011 dollars, for the period from 2013 to 2020) in sales and use taxes in the low development scenario, and $172 million in the high development scenario.

Annual economic impacts would vary each year according to variations in construction activity per the assumed wind energy deployment schedule. Tax revenues would also vary each year for the same reason.

Compared to Alternative A, if Alternatives B or C, or the Proposed LUP Amendments were implemented, the various economic indicators would decrease by 90% in either development scenario due to reduced availability of BLM-administered lands and National Forest System lands for wind energy development. If Alternative D were implemented, the economic indicators would decrease by 22%. However, readers should remember that there are many assumptions in the wind energy development projections. With

respect to differences between the alternatives, the analysis assumes that reductions in wind energy development would be directly proportional to reductions in the amount of BLM-administered lands and National Forest System lands available for wind energy development. It is possible that the differences between wind energy development projected for Alternatives B, C, and D, and the Proposed LUP Amendments versus Alternative A may be made up on the remaining available BLM-administered lands and National Forest System lands, or on other lands in the planning area.

Table 4-62. Economic Impacts of Wind Energy Development for Wyoming through 2020, Low Scenario (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$238,757	$24,042	$24,042	$186,626	$24,042
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Economic Output	$339,486	$34,186	$34,186	$265,361	$34,186
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Labor Earnings	$147,391	$14,842	$14,842	$115,209	$14,842
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Average Total Jobs Per Year	421.7	42.5	42.5	329.6	42.5
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Sale and Use Tax	$68,849	$6,933	$6,933	$53,816	$6,933
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-63. Economic Impacts of Wind Energy Development for Wyoming through 2020, High Scenario (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$596,774	$60,225	$60,225	$466,564	$60,225
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Economic Output	$848,546	$85,633	$85,633	$663,402	$85,633
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Labor Earnings	$368,404	$37,178	$37,178	$288,022	$37,178
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Average Total Jobs Per Year	1,054.0	106.4	106.4	824.0	106.4
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Sale and Use Tax	$172,088	$17,367	$17,367	$134,541	$17,367

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.

Economic Impacts of Wind Energy Production

Table 4-64 and Table 4-65 summarize the economic analysis at the statewide level for wind energy *production* based on implementation of the alternatives across the planning area. Under Alternative A, in the low development scenario, wind energy production on available BLM-administered lands and National Forest System lands in the planning area would generate $32 million in direct economic output (in present value and 2011 dollars) for the state economy in the period from 2013 to 2020, and $43 million in total economic output. This economic activity would include $24 million in labor earnings, and support an average of 188 jobs per year. In the high development scenario, wind energy production would generate $79 million in direct economic output and $106 million in total economic output; this economic activity would include $61 million in labor earnings, and support 471 jobs in 2020, the last year for which economic impacts were projected.

Wind energy production would also generate tax revenues. Under Alternative A, wind energy production in the planning area would generate $1 million (in present value and 2011 dollars, for the period from 2013 to 2020) in wind energy generation taxes and $34 million in property taxes in the low development scenario, and $3 million in wind energy generation taxes and $85 million in property taxes in the high development scenario.

Annual economic impacts would increase each year as the installed capacity and amount of wind energy production increases according to the assumed deployment schedule. Tax revenues would also increase each year for the same reasons.

Compared to Alternative A, if Alternative B, C, or E were implemented, based on the reductions in projected wind energy development (and thus production) on BLM-administered lands and National Forest System lands, the various economic indicators would decrease by 90%. If Alternative D were implemented, the economic indicators would decrease by 22%. However, readers should remember that there are many assumptions in the wind energy development and production projections. With respect to differences between the alternatives, the analysis assumes that reductions in wind energy development (and thus production as well) would be directly proportional to reductions in the amount of BLM-administered lands and National Forest System lands available for wind energy development. It is possible that the differences between wind energy development projected for Alternatives B, C, and D, and the Proposed LUP Amendments versus Alternative A may be made up on the remaining available BLM-administered lands and National Forest System lands, or on other lands in the planning area. If so, differences in wind energy production and its economic impacts would also be made up.

Table 4-64. Economic Impacts of Wind Energy Production for Wyoming through 2020, Low Scenario (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$31,674	$3,190	$3,190	$24,758	$3,190

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Economic Output	$42,539	$4,284	$4,284	$33,251	$4,284
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Labor Earnings	$24,207	$2,438	$2,438	$18,921	$2,438
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Jobs in 2020	188.4	19.0	19.0	147.3	19.0
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Generation Tax (NPV)	$1,030	$104	$104	$805	$104
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Property Tax (NPV)	$33,965	$3,420	$3,420	$26,549	$3,420
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-65. Economic Impacts of Wind Energy Production for Wyoming through 2020, High Scenario (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$79,169	$7,990	$7,990	$61,895	$7,990
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Economic Output	$106,326	$10,730	$10,730	$83,127	$10,730
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Labor Earnings	$60,505	$6,106	$6,106	$47,304	$6,106
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Total Jobs in 2020	471.0	47.5	47.5	368.2	47.5
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Generation Tax (NPV)	$2,574	$260	$260	$2,012	$260
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%
Property Tax (NPV)	$84,895	$8,567	$8,567	$66,372	$8,567
% Difference from Alt. A	N.A.	-89.9%	-89.9%	-21.8%	-89.9%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.

Livestock Grazing

The economic analysis of livestock grazing is based on a 10-year average of billed use. Because billed use may exceed actual grazing use, the economic analyses below may overstate the actual economic impacts of grazing to some degree. The reader should also note that the economic impact figures below only represent livestock grazing in sage-grouse habitat; they do not represent the total impact of livestock grazing in each BLM field office or Forest Service planning unit. Because of this, the percentage decrease between the action alternatives and Alternative A would be less on a total impact basis than in the figures below for sage-grouse habitat only.

Table 4-66 summarizes the present value analysis results for all nine field offices and planning units combined. This analysis includes impacts taking place within Wyoming outside of each BLM field office or Forest Service planning unit's specific study area. Under Alternative A, livestock grazing on BLM-administered lands and National Forest System lands within sage-grouse habitat areas in the planning area would generate $341 million in direct economic output (in present value and 2011 dollars) for the state economy in the period from 2013 to 2020, and $707 million in total economic output. This economic activity would include $233 million in labor earnings, and support an average of 1,113 jobs per year.

Table 4-67 summarizes the annual economic impacts, assuming grazing use remains constant at the 10-year average number of billed AUMs (or otherwise, that variations in use average out accordingly). Under Alternative A, livestock grazing on BLM-administered lands and National Forest System lands within sage-grouse habitat areas in the planning area would annually generate $49 million (2011 dollars) in direct economic output and $101 million in total economic output for the state economy. This economic activity would include $33 million in labor earnings and support 1,113 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 43% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-66. Economic Impacts of Livestock Grazing for Wyoming through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$340,857	$340,857	$193,783	$340,857	$340,857
% Difference from Alt. A	N.A.	0.0%	-43.1%	0.0%	0.0%
Total Economic Output	$706,579	$706,579	$400,427	$706,579	$706,579
% Difference from Alt. A	N.A.	0.0%	-43.3%	0.0%	0.0%
Total Labor Earnings	$232,873	$232,873	$132,090.96	$232,873	$232,873
% Difference from Alt. A	N.A.	0.0%	-43.3%	0.0%	0.0%
Average Total Jobs Per Year	1,112.8	1,112.8	630.9	1,112.8	1,112.8
% Difference from Alt. A	N.A.	0.0%	-43.3%	0.0%	0.0%

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-67. Annual Economic Impacts of Livestock Grazing for Wyoming (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$48,557	$48,557	$27,606	$48,557	$48,557
% Difference from Alt. A	N.A.	0.0%	-43.1%	0.0%	0.0%
Total Economic Output	$100,657	$100,657	$57,043	$100,657	$100,657
% Difference from Alt. A	N.A.	0.0%	-43.3%	0.0%	0.0%
Total Labor Earnings	$33,174	$33,174	$18,817	$33,174	$33,174
% Difference from Alt. A	N.A.	0.0%	-43.3%	0.0%	0.0%
Total Jobs Per Year	1,112.8	1,112.8	630.9	1,112.8	1,112.8
% Difference from Alt. A	N.A.	0.0%	-43.3%	0.0%	0.0%

N.A.: Not Applicable

Table 4-68 and Table 4-69 summarize the results for the Casper Field Office. The analysis uses 10-year average annual billed use estimates of 78,034 AUMs in priority/core and connectivity habitat and 60,443 AUMs in general habitat for cattle grazing, and 13,924 AUMs in priority/core and connectivity habitat and 10,785 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-68 summarizes the present value analysis results. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would generate $57 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $123 million in total economic output. This economic activity would include $41 million in labor earnings, and support an average of 184 jobs per year. Of all the field offices and planning units, the Casper Field Office has the second highest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-69 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would annually generate $8 million (2011 dollars) in direct economic output and $18 million in total economic output for the state economy. This economic activity would include $6 million in labor earnings and support 184 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if

Alternative C were implemented, the various economic indicators would decrease by 56% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-68. Economic Impacts of Livestock Grazing for the Casper Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$57,351	$57,351	$25,033	$57,351	$57,351
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%
Total Economic Output	$123,004	$123,004	$53,689	$123,004	$123,004
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%
Total Labor Earnings	$41,494	$41,494	$18,112	$41,494	$41,494
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%
Average Total Jobs Per Year	184.1	184.1	80.4	184.1	184.1
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-69. Annual Economic Impacts of Livestock Grazing for the Casper Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$8,170	$8,170	$3,566	$8,170	$8,170
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%
Total Economic Output	$17,523	$17,523	$7,648	$17,523	$17,523
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%
Total Labor Earnings	$5,911	$5,911	$2,580	$5,911	$5,911
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%
Total Jobs Per Year	184.1	184.1	80.4	184.1	184.1
% Difference from Alt. A	N.A.	0.0%	-56.4%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-70 and Table 4-71 summarize the results for the Kemmerer Field Office. The analysis uses 10-year average annual billed use estimates of 35,034 AUMs in priority/core and connectivity habitat and 46,071 AUMs in general habitat for cattle grazing, and 19,012 AUMs in priority/core and connectivity habitat and

25,001 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-70 summarizes the present value analysis results. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would generate $47 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $95 million in total economic output. This economic activity would include $31 million in labor earnings, and support an average of 167 jobs per year. Of all the field offices and planning units, the Kemmerer Field Office has the fourth highest total economic output from livestock grazing under Alternative A.

Table 4-71 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would annually generate $7 million (2011 dollars) in direct economic output and $14 million in total economic output for the state economy. This economic activity would include $4 million in labor earnings and support 167 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 43% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-70. Economic Impacts of Livestock Grazing for the Kemmerer Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$47,068	$47,068	$26,736	$47,068	$47,068
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%
Total Economic Output	$94,932	$94,932	$53,925	$94,932	$94,932
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%
Total Labor Earnings	$30,685	$30,685	$17,430	$30,685	$30,685
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%
Average Total Jobs Per Year	166.9	166.9	94.8	166.9	166.9
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-71. Annual Economic Impacts of Livestock Grazing for the Kemmerer Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$6,705	$6,705	$3,809	$6,705	$6,705
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%
Total Economic Output	$13,524	$13,524	$7,682	$13,524	$13,524
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%
Total Labor Earnings	$4,371	$4,371	$2,483	$4,371	$4,371
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%
Total Jobs Per Year	166.9	166.9	94.8	166.9	$166.9
% Difference from Alt. A	N.A.	0.0%	-43.2%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-72 and Table 4-73 summarize the results for the Newcastle Field Office. The analysis uses 10-year average annual billed use estimates of 4,875 AUMs in priority/core and connectivity habitat and 19,632 AUMs in general habitat for cattle grazing, and 301 AUMs in priority/core and connectivity habitat and 1,212 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-72 summarizes the present value analysis results. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would generate $9 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $18 million in total economic output. This economic activity would include $6 million in labor earnings, and support an average of 28 jobs per year. Of all the field offices and planning units, the Newcastle Field Office has the third lowest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-73 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would annually generate $1 million (2011 dollars) in direct economic output and $3 million in total economic output for the state economy. This economic activity would include $1 million in labor earnings and support 28 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 20% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-72. Economic Impacts of Livestock Grazing for the Newcastle Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$8,985	$8,985	$7,198	$8,985	$8,985
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%
Total Economic Output	$17,559	$17,559	$14,066	$17,559	$17,559
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%
Total Labor Earnings	$6,226	$6,226	$4,987.55	$6,226	$6,226
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%
Average Total Jobs Per Year	27.5	27.5	22.1	27.5	27.5
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-73. Annual Economic Impacts of Livestock Grazing for the Newcastle Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,280	$1,280	$1,025	$1,280	$1,280
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%
Total Economic Output	$2,501	$2,501	$2,004	$2,501	$2,501
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%
Total Labor Earnings	$887	$887	$711	$887	$887
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%
Total Jobs Per Year	27.5	27.5	22.1	27.5	27.5
% Difference from Alt. A	N.A.	0.0%	-19.9%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-74 and Table 4-75 summarize the results for the Pinedale Field Office. The analysis uses 10-year average annual billed use estimates of 27,540 AUMs in priority/core and connectivity habitat and 43,659 AUMs in general habitat for cattle grazing. There are no AUMs in sage-grouse habitat used for sheep grazing in this field office. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-74 summarizes the present value analysis results. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would generate $26 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $49 million in total economic output. This economic activity would include $17 million in labor earnings, and support an average of 74 jobs per year. Of all the field offices and planning units, the Pinedale Field Office has the sixth highest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-75 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would annually generate $4 million (2011 dollars) in direct economic output and $7 million in total economic output for the state economy. This economic activity would include $2 million in labor earnings and support 74 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 39% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-74. Economic Impacts of Livestock Grazing for the Pinedale Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$25,586	$25,586	$15,689	$25,586	$25,586
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%
Total Economic Output	$48,773	$48,773	$29,907	$48,773	$48,773
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%
Total Labor Earnings	$17,004	$17,004	$10,426.95	$17,004	$17,004
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%
Average Total Jobs Per Year	73.7	73.7	45.2	73.7	73.7
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-75. Annual Economic Impacts of Livestock Grazing for the Pinedale Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$3,645	$3,645	$2,235	$3,645	$3,645

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%
Total Economic Output	$6,948	$6,948	$4,260	$6,948	$6,948
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%
Total Labor Earnings	$2,422	$2,422	$1,485	$2,422	$2,422
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%
Total Jobs Per Year	73.7	73.7	45.2	73.7	73.7
% Difference from Alt. A	N.A.	0.0%	-38.7%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-76 and Table 4-77 summarize the results for the Rawlins Field Office. The analysis uses 10-year average annual billed use estimates of 100,866 AUMs in priority/core and connectivity habitat and 140,465 AUMs in general habitat for cattle grazing, and 4,702 AUMs in priority/core and connectivity habitat and 6,548 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-76 summarizes the present value analysis results. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would generate $91 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $184 million in total economic output. This economic activity would include $61 million in labor earnings, and support an average of 267 jobs per year. Of all the field offices and planning units, the Rawlins Field Office has the highest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-77 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would annually generate $13 million (2011 dollars) in direct economic output and $26 million in total economic output for the state economy. This economic activity would include $9 million in labor earnings and support 277 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 42% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-76. Economic Impacts of Livestock Grazing for the Rawlins Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$91,304	$91,304	$53,143	$91,304	$91,304

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%
Total Economic Output	$184,289	$184,289	$107,264	$184,289	$184,289
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%
Total Labor Earnings	$61,265	$61,265	$35,658.83	$61,265	$61,265
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%
Average Total Jobs Per Year	266.8	266.8	155.3	266.8	266.8
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-77. Annual Economic Impacts of Livestock Grazing for the Rawlins Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$13,007	$13,007	$7,571	$13,007	$13,007
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%
Total Economic Output	$26,253	$26,253	$15,280	$26,253	$26,253
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%
Total Labor Earnings	$8,728	$8,728	$5,080	$8,728	$8,728
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%
Total Jobs Per Year	266.8	266.8	155.3	266.8	266.8
% Difference from Alt. A	N.A.	0.0%	-41.8%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-78 and summarize the results for the Rock Springs Field Office. The analysis uses 10-year average annual billed use estimates of 44,312 AUMs in priority/core and connectivity habitat and 50,088 AUMs in general habitat for cattle grazing, and 26,170 AUMs in priority/core and connectivity habitat and 29,581 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-78 summarizes the present value analysis results. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would generate $56 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $115 million in total economic output. This economic activity would include $37 million in labor earnings, and support an average of 206 jobs per year. Of all

the field offices and planning units, the Rock Springs Field Office has the third highest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-79 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on BLM-administered lands within sage-grouse habitat areas in the field office would annually generate $8 million (2011 dollars) in direct economic output and $16 million in total economic output for the state economy. This economic activity would include $5 million in labor earnings and support 206 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 47% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-78. Economic Impacts of Livestock Grazing for the Rock Springs Field Office through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$56,625	$56,625	$30,045	$56,625	$56,625
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%
Total Economic Output	$115,322	$115,322	$61,189	$115,322	$115,322
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%
Total Labor Earnings	$36,947	$36,947	$19,603.75	$36,947	$36,947
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%
Average Total Jobs Per Year	206.0	206.0	109.3	206.0	206.0
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-79. Annual Economic Impacts of Livestock Grazing for the Rock Springs Field Office (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$8,067	$8,067	$4,280	$8,067	$8,067
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%
Total Economic Output	$16,428	$16,428	$8,717	$16,428	$16,428
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%
Total Labor Earnings	$5,263	$5,263	$2,793	$5,263	$5,263

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%
Total Jobs Per Year	206.0	206.0	109.3	206.0	206.0
% Difference from Alt. A	N.A.	0.0%	-46.9%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-80 and Table 4-81 summarize the results for the BTNF. The analysis uses 10-year average annual billed use estimates of 83 AUMs in priority/core and connectivity habitat and 21,845 AUMs in general habitat for cattle grazing, and no AUMs in priority/core and connectivity habitat and 1,183 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-80 summarizes the present value analysis results. Under Alternative A, livestock grazing on National Forest System lands within sage-grouse habitat areas in the planning unit would generate $8 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this planning unit in the period from 2013 to 2020, and $16 million in total economic output. This economic activity would include $6 million in labor earnings, and support an average of 25 jobs per year. Of all the field offices and planning units, the BTNF has the second lowest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-81 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on National Forest System lands within sage-grouse habitat areas in the planning unit would annually generate $1 million (2011 dollars) in direct economic output and $2 million in total economic output for the state economy. This economic activity would include $1 million in labor earnings and support 25 jobs per year.

The economic impact estimates for Alternatives B and D, and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by less than 1% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-80. Economic Impacts of Livestock Grazing for the Bridger-Teton National Forest through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$8,362	$8,362	$8,332	$8,362	$8,362
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%
Total Economic Output	$16,446	$16,446	$16,387	$16,446	$16,446
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%
Total Labor Earnings	$5,737	$5,737	$5,716.46	$5,737	$5,737

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%
Average Total Jobs Per Year	25.4	25.4	25.3	25.4	25.4
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-81. Annual Economic Impacts of Livestock Grazing for the Bridger-Teton National Forest (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,191	$1,191	$1,187	$1,191	$1,191
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%
Total Economic Output	$2,343	$2,343	$2,334	$2,343	$2,343
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%
Total Labor Earnings	$817	$817	$814	$817	$817
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%
Total Jobs Per Year	25.4	25.4	25.3	25.4	25.4
% Difference from Alt. A	N.A.	0.0%	-0.4%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-82 and Table 4-83 summarize the results for the MDBF. The analysis uses 10-year average annual billed use estimates of 513 AUMs in priority/core and connectivity habitat and 2,889 AUMs in general habitat for cattle grazing, and 57 AUMs in priority/core and connectivity habitat and 194 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-82 summarizes the present value analysis results. Under Alternative A, livestock grazing on National Forest System lands within sage-grouse habitat areas in the planning unit would generate $1 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this planning unit in the period from 2013 to 2020, and $3 million in total economic output. This economic activity would include $1 million in labor earnings, and support an average of 4 jobs per year. Of all the field offices and planning units, the MBNF has the lowest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-83 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on National Forest System lands within sage-grouse habitat areas in the planning unit would annually generate $0.2 million (2011 dollars) in direct economic output and $0.4

million in total economic output for the state economy. This economic activity would include $0.1 million in labor earnings and support 4 jobs per year.

The economic impact estimates for Alternatives B and D and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 16% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-82. Economic Impacts of Livestock Grazing for the Medicine Bow National Forest through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$1,325	$1,325	$1,117	$1,325	$1,325
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%
Total Economic Output	$2,587	$2,587	$2,181	$2,587	$2,587
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%
Total Labor Earnings	$843	$843	$711.48	$843	$843
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%
Average Total Jobs Per Year	3.9	3.9	3.3	3.9	3.9
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-83. Annual Economic Impacts of Livestock Grazing for the Medicine Bow National Forest (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$189	$189	$159	$189	$189
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%
Total Economic Output	$369	$369	$311	$369	$369
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%
Total Labor Earnings	$120	$120	$101	$120	$120
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%
Total Jobs Per Year	3.9	3.9	3.3	3.9	3.9
% Difference from Alt. A	N.A.	0.0%	-15.7%	0.0%	0.0%

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Table 4-84 and Table 4-85 summarize the results for the TBNG. The analysis uses 10-year average annual billed use estimates of 40,999 AUMs in priority/core and connectivity habitat and 57,621 AUMs in general habitat for cattle grazing, and 9,235 AUMs in priority/core and connectivity habitat and 16,732 AUMs in general habitat for sheep grazing. The analysis assumes these levels of billed use for each year from 2013 to 2020 (or otherwise, that variations in use average out at these levels).

Table 4-84 summarizes the present value analysis results. Under Alternative A, livestock grazing on National Forest System lands within sage-grouse habitat areas in the planning unit would generate $44 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this planning unit in the period from 2013 to 2020, and $86 million in total economic output. This economic activity would include $29 million in labor earnings, and support an average of 145 jobs per year. Of all the field offices and planning units, the TBNG has the fifth highest total economic output under Alternative A from livestock grazing within sage-grouse habitat areas.

Table 4-85 summarizes the annual economic impacts using the 10-year average number of billed AUMs. Under Alternative A, livestock grazing on National Forest System lands within sage-grouse habitat areas in the planning unit would annually generate $6 million (2011 dollars) in direct economic output and $12 million in total economic output for the state economy. This economic activity would include $4 million in labor earnings and support 145 jobs per year.

The economic impact estimates for Alternatives B and D and the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed later. Compared to Alternative A, if Alternative C were implemented, the various economic indicators would decrease by 40% because livestock grazing would be prohibited within sage-grouse priority habitat.

Table 4-84. Economic Impacts of Livestock Grazing for the Thunder Basin National Grassland through 2020 (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$44,252	$44,252	$26,491	$44,252	$44,252
% Difference from Alt. A	N.A.	0.0%	-40.1%	0.0%	0.0%
Total Economic Output	$85,998	$85,998	$51,568	$85,998	$85,998
% Difference from Alt. A	N.A.	0.0%	-40.0%	0.0%	0.0%
Total Labor Earnings	$29,335	$29,335	$17,527.62	$29,335	$29,335
% Difference from Alt. A	N.A.	0.0%	-40.3%	0.0%	0.0%
Average Total Jobs Per Year	144.8	144.8	87.4	144.8	144.8
% Difference from Alt. A	N.A.	0.0%	-39.6%	0.0%	0.0%

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments

N.A.: Not Applicable
All dollar figures are present values based on a 3% annual real discount rate.
Analysis assumes total annual grazing use remains constant from 2013 to 2020 at the 2003-2012 average for billed use, and assumes actual use is equivalent to billed use.

Table 4-85. Annual Economic Impacts of Livestock Grazing for the Thunder Basin National Grassland (1,000s of 2011$)

	Alt. A	Alt. B	Alt. C	Alt. D	Proposed LUP Amendments
Direct Economic Output	$6,304	$6,304	$3,774	$6,304	$6,304
% Difference from Alt. A	N.A.	0.0%	-40.1%	0.0%	0.0%
Total Economic Output	$12,251	$12,251	$7,346	$12,251	$12,251
% Difference from Alt. A	N.A.	0.0%	-40.0%	0.0%	0.0%
Total Labor Earnings	$4,179	$4,179	$2,497	$4,179	$4,179
% Difference from Alt. A	N.A.	0.0%	-40.3%	0.0%	0.0%
Total Jobs Per Year	144.8	144.8	87.4	144.8	144.8
% Difference from Alt. A	N.A.	0.0%	-39.6%	0.0%	0.0%

N.A.: Not Applicable
Analysis is based on the 2003-2012 annual average of billed forage use and assumes actual use is equivalent to billed use.

Recreation

The tables in this subsection present two views of the economic effects of recreation. Economic impact only measures the effects of new income coming into the study area. In the case of recreation, economic impact is based on the spending of non-local residents on local recreation. Economic contribution includes the effects of expenditures made by local residents (roughly, individuals who live within the socioeconomic study area), as well as the role of new income from outside the study area. In this case, economic contribution is based on the spending of local residents on local recreation and the spending of non-local residents on local recreation. Economic impact is the measure used in the analyses above of oil and gas development and production, wind energy development and production, and livestock grazing. Local residents buy only a very small proportion of the total output of those industries; therefore, a measure of economic contribution would be only slightly greater than the measure of economic impact. In the case of recreation, however, local residents make considerable recreation-related expenditures (gas, food, etc., while on local trips); therefore, it is fair to include those expenditures in an analysis of the economic role of recreation. Put another way, expenditures by local and non-local recreationists alike help keep local businesses going.

The quantitative economic analyses below for recreation consist of one set of figures for all alternatives for each geographic area. The estimates do not address differences between the alternatives. This is because the differences in management actions affecting recreation cannot be quantified. Differences in impacts between the alternatives are discussed qualitatively later. It is also important to note that the analyses assume future recreation use levels (from 2013 to 2020) remain constant at recent actual use levels. This

assumption means that the figures probably underestimate the economic effects of recreation over this period. Based on general increasing trends in outdoor recreation patterns, recreation use levels are likely to rise in most if not all the geographic areas over this period, but estimating the amount of increase would be speculative. Finally, readers should understand that the estimates of economic effects presented below are for all recreation use in each field office or planning unit; insufficient information exists to allow estimation of recreation use on habitat areas only.

Table 4-86 summarizes the present value analysis results for all nine field offices and planning units combined. This analysis includes impacts taking place within Wyoming outside of each BLM field office or Forest Service planning unit's specific study area. In economic *contribution* terms, under Alternative A, recreation on BLM-administered lands and National Forest System lands within sage-grouse habitat areas in the planning area would generate $1,910 million in direct economic output (in present value and 2011 dollars) for the state economy in the period from 2013 to 2020, and $2,405 million in total economic output. This economic activity would include $631 million in labor earnings, and support an average of 3,044 jobs per year. The corresponding figures from the viewpoint of economic impact, as discussed above, are less than the figures for economic contribution.

Table 4-87 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on BLM-administered lands and National Forest System lands within sage-grouse habitat areas in the planning area would annually generate $272 million in direct economic output (in present value and 2011 dollars) for the state economy in the period from 2013 to 2020, and $343 million in total economic output. This economic activity would include $90 million in labor earnings, and support an average of 3,044 jobs per year.

Table 4-86. Economic Effects of Recreation for Wyoming through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$1,674,172	$1,907,942
Total Economic Output	$2,127,532	$2,404,851
Total Labor Earnings	$570,286	$630,559
Average Total Jobs Per Year	2,746.5	3,043.7

Analysis is based on the best available estimates of recent recreational visitation, as noted for each BLM or Forest Service planning area.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-87. Annual Economic Effects of Recreation for Wyoming (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$238,496	$271,799
Total Economic Output	$303,081	$342,586
Total Labor Earnings	$81,241	$89,827
Total Jobs Per Year	2,746.5	3,043.7

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimates of recent recreational visitation, as noted for each BLM or Forest Service planning area.

Table 4-88 summarizes the present value analysis results for the Casper Field Office. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would generate $120 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $156 million in total economic output. This economic activity would include $40 million in labor earnings, and support an average of 184 jobs per year. Of all the field offices and planning units, the Casper Field Office has the fifth highest total economic output.

Table 4-89 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would annually generate $17 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $22 million in total economic output. This economic activity would include $6 million in labor earnings, and support an average of 184 jobs per year.

Table 4-88. Economic Effects of Recreation for the Casper Field Office through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$102,192	$119,948
Total Economic Output	$134,651	$156,404
Total Labor Earnings	$35,112	$40,029
Average Total Jobs Per Year	162.0	184.1

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-89. Annual Economic Effects of Recreation for the Casper Field Office (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$14,558	$17,087
Total Economic Output	$19,182	$22,281
Total Labor Earnings	$5,002	$5,702
Total Jobs Per Year	162.0	184.1

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.

Table 4-90 summarizes the present value analysis results for the Kemmerer Field Office. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would generate $48 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $57 million in total economic output. This economic activity would include $12 million in labor earnings, and support an average of 67 jobs per year. Of all the field offices and planning units, the Kemmerer Field Office has the second lowest total economic output.

Table 4-91 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would annually generate $7 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $8 million in total economic output. This economic activity would include $2 million in labor earnings, and support an average of 67 jobs per year.

Table 4-90. Economic Effects of Recreation for the Kemmerer Field Office through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$30,219	$48,486
Total Economic Output	$36,204	$57,124
Total Labor Earnings	$7,902	$11,898
Average Total Jobs Per Year	44.7	67.1

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-91. Annual Economic Effects of Recreation for the Kemmerer Field Office (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$4,305	$6,907
Total Economic Output	$5,158	$8,138
Total Labor Earnings	$1,126	$1,695
Total Jobs Per Year	44.7	67.1

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.

Table 4-92 summarizes the present value analysis results for the Newcastle Field Office. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would generate $2 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $3 million in total economic output. This economic activity would include $0.7 million in labor earnings, and support an average of 4 jobs per year. Of all the field offices and planning units, the Newcastle Field Office has by far the lowest total economic output.

Table 4-93 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would annually generate $0.3 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $0.4 million in total economic output. This economic activity would include $0.1 million in labor earnings, and support an average of 4 jobs per year.

Table 4-92. Economic Effects of Recreation for the Newcastle Field Office through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$1,681	$2,378
Total Economic Output	$2,124	$2,945
Total Labor Earnings	$540	$719
Average Total Jobs Per Year	2.9	3.8

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-93. Annual Economic Effects of Recreation for the Newcastle Field Office (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$239	$339
Total Economic Output	$303	$420
Total Labor Earnings	$77	$102
Total Jobs Per Year	2.9	3.8

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.

Table 4-94 summarizes the present value analysis results for the Pinedale Field Office. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would generate $221 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $265 million in total economic output. This economic activity would include $66 million in labor earnings, and support an average of 380 jobs per year. Of all the field offices and planning units, the Pinedale Field Office has the third highest total economic output.

Table 4-95 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would annually generate $31 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $38 million in total economic output. This economic activity would include $9 million in labor earnings, and support an average of 380 jobs per year.

Table 4-94. Economic Effects of Recreation for the Pinedale Field Office through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$198,494	$220,918
Total Economic Output	$239,432	$264,982
Total Labor Earnings	$60,277	$65,568
Average Total Jobs Per Year	349.8	379.5

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2010.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-95. Annual Economic Effects of Recreation for the Pinedale Field Office (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$28,277	$31,471
Total Economic Output	$34,109	$37,748
Total Labor Earnings	$8,587	$9,341
Total Jobs Per Year	349.8	379.5

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2010.

Table 4-96 summarizes the present value analysis results for the Rawlins Field Office. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would generate $84 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $107 million in total economic output. This economic activity would include $25 million in labor earnings and support an average of 132 jobs per year. Of all the field offices and planning units, the Rawlins Field Office has the sixth highest total economic output.

Table 4-97 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would annually generate $12 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $15 million in total economic output. This economic activity would include $4 million in labor earnings, and support an average of 132 jobs per year.

Table 4-96. Economic Effects of Recreation for the Rawlins Field Office through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$71,708	$84,168
Total Economic Output	$92,010	$107,043
Total Labor Earnings	$22,143	$25,270
Average Total Jobs Per Year	116.2	132.4

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-97. Annual Economic Effects of Recreation for the Rawlins Field Office (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$10,215	$11,990
Total Economic Output	$13,107	$15,249
Total Labor Earnings	$3,154	$3,600
Total Jobs Per Year	116.2	132.4

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.

Table 4-98 summarizes the present value analysis results for the Rock Springs Field Office. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would generate $173 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $207 million in total economic output. This economic activity would include $47 million in labor earnings and support an average of 246 jobs per year. Of all the field offices and planning units, the Rock Springs Field Office has the fourth highest total economic output.

Table 4-99 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on BLM-administered lands in this field office would annually generate $25 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this field office in the period from 2013 to 2020, and $30 million in total economic output. This economic activity would include $7 million in labor earnings and support an average of 246 jobs per year.

Table 4-98. Economic Effects of Recreation for the Rock Springs Field Office through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$155,574	$173,446
Total Economic Output	$186,766	$207,357
Total Labor Earnings	$42,671	$46,779
Average Total Jobs Per Year	223.7	245.7

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-99. Annual Economic Effects of Recreation for the Rock Springs Field Office (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$22,162	$24,708
Total Economic Output	$26,606	$29,539
Total Labor Earnings	$6,079	$6,664
Total Jobs Per Year	223.7	245.7

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimate of recent recreational visitation, the BLM RMIS estimate of total visits for FFY 2012.

Table 4-100 summarizes the present value analysis results for the BTNF. In economic contribution terms, under Alternative A, recreation on National Forest System lands in this planning unit would generate $903 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this planning unit in the period from 2013 to 2020, and $1,112 million in total economic output. This economic activity would include $325 million in labor earnings and support an average of 1,437 jobs per year. Of all the field offices and planning units, the BTNF has by far the highest total economic output.

Table 4-101 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on National Forest System lands in this planning unit would annually generate $129 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this planning unit in the period from 2013 to 2020, and $158 million in total economic output. This economic activity would include $46 million in labor earnings and support an average of 1,437 jobs per year.

Table 4-100. Economic Effects of Recreation for the Bridger-Teton National Forest through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$811,412	$903,081
Total Economic Output	$1,005,448	$1,111,555
Total Labor Earnings	$299,603	$324,620
Average Total Jobs Per Year	1,324.6	1,437.2

Analysis is based on the best available estimate of recent recreational visitation, the Forest Service NVUM estimate of total visits for FFY 2008.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-101. Annual Economic Effects of Recreation for the Bridger-Teton National Forest (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$115,591	$128,650
Total Economic Output	$143,233	$158,348
Total Labor Earnings	$42,680	$46,244
Total Jobs Per Year	1,324.6	1,437.2

	Economic Effect, All Alternatives	
	Impact	Contributions

Analysis is based on the best available estimate of recent recreational visitation, the Forest Service NVUM estimate of total visits for FFY 2008.

The best available recreation use and expenditures data for the MBNF and TBNG is from the NVUM survey done in 2008. This survey combined the data for both Forest Service-administered areas. Therefore, the economic analysis is also combined for both planning areas.

Table 4-102 summarizes the present value analysis results for the MBNF and TBNG. In economic contribution terms, under Alternative A, recreation on National Forest System lands in this planning unit would generate $355 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this planning unit in the period from 2013 to 2020, and $435 million in total economic output. This economic activity would include $98 million in labor earnings and support an average of 555 jobs per year. Of all the field offices and planning units, the MBNF and TBNG (combined) has the second highest total economic output.

Table 4-103 summarizes the annual economic effects of recreation, based on recent actual annual use levels. In economic contribution terms, under Alternative A, recreation on National Forest System lands in this planning unit would annually generate $51 million in direct economic output (in present value and 2011 dollars) for the economy of the socioeconomic study area for this planning unit in the period from 2013 to 2020 and $62 million in total economic output. This economic activity would include $14 million in labor earnings and support an average of 555 jobs per year.

Table 4-102. Economic Effects of Recreation for the Medicine Bow National Forest and Thunder Basin National Grassland through 2020 (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$302,891	$355,518
Total Economic Output	$373,417	$434,816
Total Labor Earnings	$85,502	$97,625
Average Total Jobs Per Year	486.9	554.6

Analysis is based on the best available estimate of recent recreational visitation, the Forest Service NVUM estimate of total visits for FFY 2008.
Analysis assumes annual recreation use from 2013 to 2020 remains constant at recent levels.
All dollar figures are present values based on a 3% annual real discount rate.

Table 4-103. Annual Economic Effects of Recreation for the Medicine Bow National Forest and Thunder Basin National Grassland (1,000s of 2011$)

	Economic Effect, All Alternatives	
	Impact	Contributions
Direct Economic Output	$43,149	$50,646
Total Economic Output	$53,196	$61,942

	Economic Effect, All Alternatives	
	Impact	Contributions
Total Labor Earnings	$12,180	$13,907
Total Jobs Per Year	486.9	554.6

Analysis is based on the best available estimate of recent recreational visitation, the Forest Service NVUM estimate of total visits for FFY 2008.

4.11.5 Economic Impacts by Alternative

Many of the management actions for each alternative were incorporated into the minerals RFD, the wind RFD, and the calculations of AUMs. The economic impacts of those actions have thus been incorporated into the quantitative impact estimates in Section 4.11.4. Each of the subsections below briefly summarize the projected physical levels of oil and gas leasing, wind energy development, grazing use, and recreation under a specific alternative; these physical levels underpin the quantitative impact estimates of Section 4.11.4. Management actions that would have additional economic impacts are then discussed qualitatively for the alternative.

In general, management actions may have two types of economic impacts that are amenable to qualitative discussion:

- *Level of economic activity*: Management actions may directly affect (increase or decrease) the level of economic activity, for example, by allowing or prohibiting certain resource uses, or committing the government to certain types of expenditures.

- *Costs of projects and operations*: Management actions may affect (increase or decrease) the costs of projects on BLM-administered lands and National Forest System lands or operating costs for users of these lands.

In cases where costs are increased, several results can occur, sometimes simultaneously:

- *Reduced economic activity:* Increased costs may impact the financial viability of certain projects or operators – which may result in reduced economic activity. In general, it is rare for cost increases to directly preclude projects or result in operators going out of business, as project proponents and operators will seek other approaches, such as reconfiguring or moving projects or operations. However, projects or operations may be scaled back, or if they are moved a great distance, the local economy experiences a loss.

- *Increase economic activity:* Increased costs may result in greater expenditures being made in the local area and state. To the extent this occurs, the increased costs may reduce profits for operators, but the increased expenditures benefit the local economy by generating additional economic activity in the form of income and jobs in the economic sectors receiving the expenditures.

- *The net effect:* In many cases it is not possible to identify which effect – increased or decreased economic activity – will predominate, without considerably more information.

The subsections below qualitatively discuss potential economic impacts from various management actions, to the extent impacts can reasonably be expected to occur, based on the limited information available. Impacts that are largely speculative or hypothetical are not included. In some places the text reminds readers that certain management actions are addressed quantitatively in Section 4.11.4 rather than qualitatively.

Economic Impacts of Alternative A

Based on the restrictions or prohibitions on locations for surface disturbing and disruptive activities and unavailability of sensitive resource areas for oil and gas leasing, the RFD scenario for oil and gas development for Alternative A projects the drilling of 12,585 oil, gas, and CBNG wells on federal mineral estate within sage-grouse habitat areas between 2013 and 2020. The quantifiable economic impacts of this level of oil and gas development, and resulting oil and gas production, are presented in Section 4.11.4.

Based on the assumptions and caveats described in Section 4.11.3, which incorporate limitations on wind development from various decisions, a total of 1,003 MW of wind energy capacity is projected to be developed on BLM-administered lands and National Forest System lands by 2020 under Alternative A in the low development scenario, and 2,507 MW in the high development scenario. The quantifiable economic impacts of these levels of wind power development and resulting wind energy production are presented in Section 4.11.4.

Section 4.11.4 also presents the quantifiable economic impacts of livestock grazing on BLM and Forest Service-managed land within sage-grouse habitat areas under Alternative A. The estimated impact is based on historical billed AUMs and assumes this level of use will continue through 2020.

Section 4.11.4 also presents the quantifiable economic impacts of recreation. The estimated impacts are based on recent levels of recreation use on BLM and Forest Service-managed land throughout each BLM and Forest Service planning area and assume these levels of use will continue through 2020. The estimated impacts are the same for all alternatives because differences in management actions affecting recreation cannot be quantified.

Some of the quantifiable economic impact of recreation is directly attributable to the presence of sage-grouse in the planning area. To the extent that sage-grouse populations are maintained or enhanced by this alternative, recreation centered on sage-grouse (bird-watching, hunting) would be maintained or enhanced. These activities have economic effects on local communities and the state. The Wyoming Game and Fish Department (WGFD) (2010b) estimates that in 2009, hunter expenditures related to sage-grouse hunting in Wyoming amounted to $2.937 million. Total economic impacts would be greater because of the multiplier effect. An unknown amount of expenditures are generated by birders who travel to leks to observe sage-grouse. To the extent these activities bring in visitors from outside a BLM field office or Forest Service planning unit, or from outside the state, they are important to the local/state economy because these visitors' expenditures represent an influx of money into the economy

Additional potential economic impacts from various management actions of this alternative are discussed qualitatively below.

Certain lands and realty management actions may result in increased costs for project proponents and thus could affect (increase or decrease) levels of economic activity. These include:

- Managing portions of sage-grouse core habitat areas as ROW exclusion zones and portions of sage-grouse general habitat areas as ROW avoidance areas may result in more costly routing of utilities relative to unconstrained corridors.

- Constraints on location and uses of new or adjusted utility corridors in sage-grouse core and connectivity habitat areas may result in more costly routing of utilities relative to unconstrained corridors.

- Requiring burial of utility lines or anti-perch devices in the Kemmerer Field Office would increase project costs.

- MET tower location restrictions in the Kemmerer and Rawlins Field Offices may result in increased project costs.

The economic impact of the level of wind energy development allowed for in this alternative is encompassed in the quantitative analysis in Section 4.11.4.

Allowing for disposal of identified public lands within sage-grouse core habitat would allow for increased economic activity through development or alternative uses of those parcels, and/or allow for generation of property tax revenues from the parcels that pass into private ownership, but in such cases would also result in some downward adjustment of PILTs to local government.

Pursuing acquisition of lands and interests in lands in certain areas of the Rawlins and Casper Field Offices would reduce property taxes but also increase PILTs, commensurate with the amount of land or interests in land acquired.

Allowing for determination of a variety of actions to address non-achievement of land health standards and non-conformance with guidelines due to existing grazing management practices or levels of grazing use in sage-grouse core habitat areas may result in reductions in grazing use and thus could reduce economic activity or result in increased costs for operators.

Management actions related to the design and implementation of livestock grazing strategies as part of the grazing permit renewal process may result, in some specific cases, in increased costs to operators or reduced grazing levels and thereby could affect levels of economic activity.

Voluntary relinquishment of grazing permits or grazing preference, as provided for in BLM and Forest Service regulations, would result in reduced economic activity to the extent that permits or AUMs are retired. Under BLM grazing regulations, permits that are relinquished are offered to other applicants unless specific decisions are made to retire the grazing preference. Retirement is a difficult and complex process that is not often carried out. Forest Service regulations require that grazing permits be waived back to the Forest Service and are only retired if there is an identified resource issue that needs to be addressed. Therefore, there would likely be little or no change expected to economic activity in this alternative related to voluntary relinquishment of grazing permits or grazing preference.

Management actions setting various requirements or standards for range development projects may result in increased costs to operators relative to projects without such requirements.

Management actions for livestock grazing in riparian areas may result in reductions in use and/or affect the practices of grazing operators and/or planned improvements. These effects may result in reduced economic activity and/or increased costs to operators.

Federal AUMs can be quite important to ranch economic viability. Recent research by Torell and others (2014) provides information on potential impacts to ranch-level economics given any reductions or alterations to federal grazing. For example, based upon the Wyoming Ranch Model, Torell and others (2014) estimated that a 25% reduction in BLM AUMs would reduce an operator's herd size by 10% and create an average change in net income of negative $14.91 per BLM AUM removed. A 25% reduction in BLM AUMs creates a 24% probability of negative net annual returns over fixed costs, which is only two percentage points increase over the 22% probability of this occurring with no reductions in BLM AUMs (Torell and others 2014). It should be noted, though, that the Wyoming Ranch Model is based on production practices associated with a large ranch operation that derives 45% of forage from public lands (BLM and state rangelands) on a year-round basis and 90% for spring and summer forage (Torell and others 2014).

Ranch operations that differ from what was modeled would see either more or less ranch level economic impacts.

The economic impacts of a number of the minerals management decisions in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

Allowing for exceptions, waivers, and modifications to minerals lease stipulations, COAs, and T&Cs on a case-by-case basis may allow for some increases in economic activity relative to not allowing these modifications.

Continuation of various policies within the existing RMPs and LRMPs will allow for or prohibit geophysical exploration, and thereby affect economic activity (expenditures associated with exploration) or may affect costs of exploration.

Requirements for mitigation and other COAs may increase costs to operators and in certain cases (Rock Springs/Green River RMP), may affect the level of economic activity relative to not having such requirements.

Continuation of various policies within the existing RMPs and LRMPs regarding coal leasing, and allowances for coal exploration activities, generally allow for exploration for and development of coal resources and the economic activity that would result.

Provisions for non-energy mineral leasing, and allowances for related exploration/prospecting activities, generally allow for exploration and development of coal resources, and the economic activity that would result.

Withdrawal of portions of sage-grouse core habitat from mineral entry for locatable mineral development may result in reductions in economic activity; however, this depends on the location of economically developable locatable mineral resources relative to core habitat areas.

Continuation of various policies within the existing RMPs and LRMPs regarding outdoor recreation management, including SRPs and SUAs, allow for economic activity attendant to recreation on BLM-administered lands and National Forest System lands.

Managing the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area within the Casper, Rawlins, and Rock Springs Field Offices, respectively, as OHV "open" areas would preserve open OHV access and maintain the economic activity associated with this use.

The economic impacts of avoidance of surface disturbance or occupancy in certain areas (e.g., for road building for oil and gas development) are encompassed in the quantitative analysis in Section 4.11.4.

A number of management actions in this alternative would generate economic activity due to the resulting expenditures made in the local and state economies, although the level of economic activity from many of these actions would be small relative to the activity generated by resource uses. Relevant management actions include:

- Reclaiming unauthorized, redundant, or unnecessary travel routes.
- Vegetation treatment and vegetation management projects.

- Fencing (i.e., resting) of treated (e.g., burn) areas from grazing. (However, this may reduce the economic activity generated by grazing).
- Reclamation of surface disturbances.
- Vegetation reclamation standards requiring use of native/genetically local plants or seeds.
- Activities to control outbreaks of grasshoppers and Mormon crickets.
- Provision of water developments to improve wild horse distribution and manage forage utilization.
- Wildland fire fuels management/reduction activities (prescribed burns, mechanical, chemical, and biological treatments).
- Stabilization and restoration activities subsequent to wildland fires.
- Woodland encroachment treatments in certain grassland, sagebrush, aspen, and other vegetative communities.

Onsite and offsite mitigation considerations in the Pinedale RMP, while not required, may result in increased costs for operators in that field office relative to not having such considerations. This could impact (reduce) levels of economic activity, but more likely operations would remain at the same level and the costs of mitigation actions would result in increased levels of economic activity.

Restrictions on timing and distance of surface disturbance, surface occupancy, and in some cases, other wildlife-disturbing activity or general human activities, are partly encompassed in the quantitative analysis in Section 4.11.4. These restrictions would have various additional impacts; e.g., use of directional drilling to access fluid mineral resources under NSO areas or changes to operators' practices for accessing sites. In rare cases, where operators cannot make adjustments, these restrictions may result in reducing economic activity. In most cases, the restrictions are likely to result in increased costs that would generate increased economic activity.

Actions necessary to limit noise impacts to sage-grouse (e.g., siting of facilities, use of BMPs such as mufflers) would result in costs for operators. It is likely that operations would remain at the same level and the costs of noise reduction actions would result in increased levels of economic activity.

Impacts to Non-market Values

The term *non-market values* refers to the benefits individuals attribute to experiences of the environment or uses of natural and cultural resources that do not involve market transactions and therefore lack prices. This includes direct and indirect use values and also non-use values (sometimes referred to as passive use values). *Use value* includes the benefits an individual directly derives from some experience or activity, such as climbing a spectacular peak, hunting, or wildlife viewing. Use value also includes indirectly received benefits, such as from ecosystem services, which are environmental functions, processes, and characteristics that are valuable to people because they support, enable or protect human activity. Examples include crop pollination services provided by wild bees and other insects, and flood control from intact wetlands. In contrast, *non-use value* refers to the utility or psychological benefit some people derive from the existence of some environmental condition that may never be directly experienced: an unspoiled Grand Canyon or the continued presence of an endangered species. These different types of values and the methods for estimating them are discussed further in the Socioeconomic Baseline Report.

There are many non-market values associated with BLM-administered lands and National Forest System lands in the planning area. A few of the most relevant non-market values are discussed below and for the other alternatives; these are the un-priced economic benefits associated with recreation, livestock grazing, the existence and preservation of Greater Sage-Grouse and ecosystem services.

Non-market economic values associated with recreation are relatively amenable to quantitative estimation. These values are in addition to the market-based economic values quantified in Section 4.11.4. As discussed in the Socioeconomic Baseline Report, consumer surplus is a measure of non-market value that refers to the maximum dollar amount a consumer would be willing to pay to enjoy a good or service, above any actual payments made such as expenditures to get to a recreation site. It is a measure of the value recreationists receive that is not priced in markets. Consumer surplus values have been researched and quantified in many studies in the economics literature for many recreation activities and many locations (see for example, Loomis 2005 and Rosenberger 2012). Values from this literature can be applied to new locations using a methodology known as "benefits transfer."

For a high-level estimate of the consumer surplus values associated with recreation in the planning area, this EIS for sage-grouse management in Wyoming utilized some of the results from an analysis for Chapter 4 of the Northwest Colorado Greater Sage-Grouse Draft Land Use Plan Amendment/EIS (BLM 2013b). The benefits transfer approach was used in the Colorado sage-grouse EIS. The Colorado sage-grouse EIS methodology and its application to this Wyoming EIS are described in Appendix N, Technical Report: Social and Economic Impact Analysis Methodology. The applicability of the Colorado study to this study is also discussed in the appendix. In summary, the average consumer surplus value per day from the Colorado was applied to estimated visitor days on BLM-administered lands and National Forest System lands in the planning area in Wyoming.

In round numbers, appropriate to the uncertainties inherent in the estimation of non-market values, the estimated total consumer surplus value associated with recreation on BLM-administered lands and National Forest System lands across the entire Wyoming planning area is $362 million on an annual basis, and $2,543 million in net present value over the period 2013–2020, using a 3% discount rate. These figures represent the value of the additional benefits, expressed in dollar terms, which recreationists derive from their activities on BLM-administered lands and National Forest System lands, above and beyond the value represented by their actual expenditures for their recreational activities.

It is very important to note that this consumer surplus value is not directly comparable to the economic output or labor earnings figures generated by IMPLAN and reported in Section 4.11.4 (BLM Instruction Memorandum No. 2013-131, Guidance on Estimating Nonmarket Environmental Values, May 31, 2013). They represent different portions of the total economic value of any activity, which encompasses both the values that are exchanged in markets and values that are not exchanged in markets. Output and labor earnings, including for recreation in Section 4.11.4, are values that are revealed in market transactions, while the consumer surplus value for recreation in this section is an additional and different type of economic value. In addition, output and labor earnings reflect the multiplier effect that generates additional economic activity from the original expenditures or sales. There is no corollary for consumer surplus to the multiplier effect for market transactions. The point of estimating consumer surplus value is not to compare that value with output or labor earnings, but to show that while the nonmarket benefits of BLM-administered lands and National Forest System lands do not have prices, their value is substantially greater than zero. As noted in the previously cited BLM Instruction Memorandum, this value and other non-market values should be considered in the planning process.

As with recreation, public land managed for livestock grazing provides both market values (in this case, forage that generates cash value when livestock are sold) and non-market values. The non-market values associated with livestock grazing includes the scenic value of open livestock range and ranch operations,

including private land that is maintained in ranching in part because of the availability of public grazing lands. Non-market values also include the traditions, customs, and culture of ranching in the west, which have experiential value to ranching participants, surrounding communities and some visitors, and also broader value (passive use value) to the non-using public who, for instance, appreciate the historic and living cultural icon of the American cowboy and independent rancher. One indicator of the non-market value of grazing land is that purchases of ranches sometimes occur at prices in excess of the production value of the forage on the land. Some of the literature regarding non-market values of grazing land is discussed in the Colorado sage-grouse EIS (BLM 2013b), which also notes that some people see non-market opportunity costs associated with livestock grazing, such as the potential for forage losses for wildlife or for conflicts between livestock grazing and other lifestyles that utilize public lands.

To the extent that management actions of Alternative A help livestock grazing operators remain in business and continue to use BLM-administered lands and National Forest System lands, this alternative would help maintain the non-market benefits (and any non-market costs as well) associated with livestock grazing on BLM-administered lands and National Forest System lands. Analytical methods are available to quantify some of these non-market values, but there are many uncertainties in applying those methods; therefore, the BLM and Forest Service did not attempt to quantify these values.

Another set of non-market values relevant to this EIS involves the preservation of Greater Sage-Grouse. Many studies have shown that rare species have economic values beyond the use values associated with viewing the animals (Richardson and Loomis 2009). Further, the existence and perseverance of the Endangered Species Act (ESA) indicates the value that the public places on preventing species from going extinct. These observations illustrate the idea of "existence value," a passive use value. This subject is discussed further in the Socioeconomic Baseline Report. Passive use values can be quite large, because the population of people who experience a particular passive use value can be very large. However, it is also true that, due to the hypothetical payment nature of "stated preference" studies (e.g., contingent valuation surveys) of passive use values, there is likely to be some overestimation in the results of these studies – stated willingness to pay, per person or household (Loomis 2011).

For the Colorado sage-grouse EIS (BLM 2013b), the BLM and Forest Service conducted a literature review to identify studies that have quantified the non-market values associated with Greater Sage-Grouse. No studies specific to Greater Sage-Grouse were identified. However, several studies addressing the value of protecting habitat for bird species with similar characteristics to Greater Sage-Grouse were identified. These studies found average stated willingness to pay of between $15 and $58 per household per year in order to restore a self-sustaining population or prevent regional extinction. The general conclusions of the findings in the Colorado sage-grouse EIS are also applicable to this Wyoming EIS: "These values represent a mix of use and non-use values, but the non-use components of value are likely to be the majority share, since the studies primarily address species that are not hunted. Since Greater Sage-Grouse protection is a public good available to all households throughout the inter-mountain west, if similar per-household values apply to the species, the aggregate regional existence value could be substantial." To the extent that management actions under Alternative A help maintain sage-grouse populations, non-market values associated with Greater Sage-Grouse would be maintained. If this alternative's management actions result in reduced sage-grouse populations, non-market values would be impacted.

Sage-grouse habitat provides a variety of ecosystem services that benefit people. Some of these services are encompassed in the discussions above. For instance, recreational experiences are a type of "cultural service" provided by functioning ecosystems. (For further discussion of the concept of ecosystem services and types of ecosystem services, see Ruhl *et al.* 2007.) Some additional ecosystem services provided by sage-grouse habitat may include: regulation of local/regional aspects of the hydrologic cycle; purification of water and air; support of insects that help pollinate crops used by humans; support of insects and animals that help control crop pests; production of plants gathered by people for culinary, aesthetic, cultural or

medicinal purposes; support of additional species (e.g., other rare species) that have passive use values; and opportunities for scientific discovery. To the extent that management actions under Alternative A help protect the ecological functioning of sage-grouse habitat, this alternative supports the provision of ecosystem services by those habitat areas. At the same time, management actions under Alternative A may permit degradation of ecosystem services. For instance, resource development may impact hydrologic functions on the land, and grazing may impact the mix of plants, insects, and animals in ways that alter ecosystem service functions.

Economic Impacts of Alternative B

Based on restrictions to surface disturbing and disruptive activities, limitations on density of disturbance, and the areas closed to oil and gas leasing, the RFD scenario for Alternative B projects the drilling of 10,712 oil, gas, and CBNG wells on federal mineral estate within sage-grouse habitat areas between 2013 and 2020. Compared to Alternative A, this would be 1,873 fewer projected wells. The quantifiable economic impacts of this level of oil and gas development, and resulting oil and gas production, are presented in Section 4.11.4.

Based on the assumptions and caveats described in Section 4.11.3, which incorporate limitations on wind development from various decisions, a total of 101 MW of wind energy capacity is projected to be developed on BLM-administered lands and National Forest System lands by 2020 under Alternative B in the low development scenario, and 253 MW in the high development scenario. Compared to Alternative A, this would be 902 fewer MW of capacity in the low development scenario, and 2,254 fewer MW in the high development scenario. The quantifiable economic impacts of these levels of wind power development and resulting wind energy production are presented in Section 4.11.4.

The quantifiable economic impacts of sage-grouse habitat management on livestock grazing presented in Section 4.11.4 for Alternative B are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed below.

The quantifiable economic impacts of recreation presented in Section 4.11.4 are the same for each alternative. This is because the differences in management actions affecting recreation cannot be quantified. Qualitative differences in impacts are discussed below.

Some of the quantifiable economic impact of recreation is directly attributable to the presence of sage-grouse in the planning area. To the extent that sage-grouse populations are maintained or enhanced by this alternative, recreation centered on sage-grouse (bird-watching, hunting) would be maintained or enhanced. Economic impacts would be similar to Alternative A. These impacts might be larger or more likely to be maintained under this alternative because of its greater focus on conservation compared to Alternative A.

Additional potential economic impacts from various management actions of this alternative are discussed qualitatively below.

Certain lands and realty management actions may result in further increased costs for project proponents and thus could further affect (increase or decrease) levels of economic activity relative to Alternative A. These include:

- Managing sage-grouse priority habitat areas as exclusion areas and general habitat areas as avoidance areas (subject to some exceptions) for new ROWs and SUAs may result in more costly routing of utilities relative to Alternative A and further increase utility project costs.

- Prohibiting new above-ground transmission structures both inside and outside existing corridors would likely increase project costs relative to Alternative A.

- Not authorizing new transmission corridors in sage-grouse priority and connectivity habitat areas, and relocating or un-designating ROW corridors would further constraint such utility projects relative to Alternative A. This may result in more costly routing of utilities and further increase utility project costs.

Prohibiting MET towers in sage-grouse priority habitat areas would result in some decrease in economic activity relative to Alternative A.

The economic impact of the level of wind energy development allowed for in this alternative is encompassed in the quantitative analysis in Section 4.11.4.

Retaining public ownership of public land within sage-grouse priority habitat (subject to certain exceptions) may result in reduced disposal of public lands relative to Alternative A. This may result in less economic activity from development or alternative uses of disposed parcels, and/or the generation of property taxes from parcels passing into private ownership may be reduced, while PILTs would be less reduced.

Acquisition of lands and interests in lands in this alternative would reduce property taxes from the acquired parcels but also increase PILTs. However, the impact relative to Alternative A cannot be determined because the relative level of acquisition activity cannot be determined at this time.

Incorporating a light grazing management strategy utilizing a 20% to 30% forage allocation for livestock in allotments not meeting standards due to livestock grazing in sage-grouse priority habitat may result in reductions in grazing use and thus could reduce economic activity, or may result in increased costs for operators, relative to the status quo. However, impacts relative to Alternative A cannot be determined because the relative level of changes to grazing availability cannot be determined at this time.

As in Alternative A, voluntary relinquishment of grazing privileges would result in reduced economic activity to the extent that permits or grazing preference are retired. This alternative provides additional guidance regarding retirement. However, impacts relative to Alternative A cannot be determined because the actual, relative level of retirement cannot be determined at this time.

Management actions setting additional requirements or standards for range development projects may result in some cost increases for operators relative to Alternative A.

Management actions for livestock grazing in riparian areas would have similar impacts to Alternative A, but may result in some additional reductions in use and/or changes to practices of grazing operators and/or planned improvements, relative to Alternative A.

The economic impacts of a number of the minerals management decisions in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

Not allowing for exceptions, waivers, and modifications to minerals lease stipulations, COAs, and T&Cs in sage-grouse priority habitat may result in some decreases in economic activity or increases in costs relative to Alternative A.

The economic impacts of geophysical exploration would be similar to Alternative A; however, constraints on the methods of exploration may increase costs of some exploration activities relative to Alternative A.

As in Alternative A, mitigation requirements and other COAs may affect operator costs and in certain cases may affect the level of economic activity. However, the impact relative to Alternative A cannot be determined because the exact types and relative levels of requirements and conditions cannot be determined at this time.

Not allowing new surface occupancy on leases within priority habitats may require utilization of more costly directional drilling technologies, which would increase economic activity unless accessing the resource becomes un-economic and wells are foregone, and not make up for elsewhere.

The economic impact of the management actions for coal exploration and coal leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed coal exploration activity or lease relative to sage-grouse priority habitat areas.

The economic impact of the management actions for non-energy mineral exploration and leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed non-energy mineral exploration activity or lease relative to sage-grouse priority habitat areas.

The economic impacts of withdrawal of portions of sage-grouse priority habitat from mineral entry for locatable mineral development based on risk to sage-grouse and its habitat, relative to Alternative A, cannot be determined because the effects of this action depend on the location of economically developable locatable mineral resources relative to priority habitat areas and in comparison to the withdrawn areas that would occur under Alternative A.

Mitigation requirements for locatable mineral development may increase costs for operators relative to Alternative A.

Closing sage-grouse priority habitat areas to mineral material exploration, sale, and free use permits may reduce economic activity relative to Alternative A; however, substitute areas for mineral materials in many cases may be available outside of priority habitat areas.

In priority habitat, restoring salable mineral pits no longer in use to meet sage-grouse habitat conservation objectives may result in increased economic activity (expenditures for restoration).

Not allowing SRPs and SUAs that do not have neutral or beneficial effects to priority habitat areas may result in some reductions in economic activity relative to Alternative A.

The economic impacts of designations of sage-grouse ACECs/SIAs are encompassed in the quantitative analysis in Section 4.11.4.

The economic impacts resulting from OHV use in the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area would be similar to those identified in Alternative A, except the non-sand dune portions of these areas would be managed as “limited to designated roads and trails.” This would probably not greatly reduce economic activity because the sand dune portions of these areas would continue to be managed as OHV “open” areas; thus, a wide range of OHV user types would still be accommodated.

Not allowing upgrading of certain existing routes in priority habitat and implementing constraints on new road standards may reduce economic activity (e.g., reduced expenditures on routes, and possibly reductions in activities that would be fostered by upgrades) relative to Alternative A.

A number of management actions in this alternative would generate economic activity due to the resulting expenditures made in the local and state economies, although the level of economic activity from many of these actions would be small relative to the activity generated by resource uses. Relevant management actions include:

- Reclaiming unauthorized, redundant, or unnecessary travel routes – economic impacts would be similar to Alternative A.
- Vegetation treatment and vegetation management projects – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.
- Fencing/resting of treated areas – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.
- Reclamation of surface disturbances – economic impacts would be the same as Alternative A.
- Vegetation reclamation standards requiring use of native/genetically local plants or seeds – economic impacts would be similar to Alternative A.
- Economic activity from activities to control outbreaks of grasshoppers and Mormon crickets may be reduced in priority habitat areas relative to Alternative A.
- Provision of water developments to improve wild horse distribution and manage forage utilization – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.
- Wildland fire fuels management/reduction activities (prescribed burns, mechanical, chemical, and biological treatments) – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.
- Stabilization and restoration activities subsequent to wildland fires – increased economic activity may be generated relative to Alternative A due to additional emphasis on restoring, recovering, maintaining, and enhancing sage-grouse habitat.
- Woodland encroachment treatments in certain grassland, sagebrush, aspen, and other vegetative communities are not explicitly included in this alternative; thus, economic activity from such treatments may be reduced relative to Alternative A.

Design of post Emergency Stabilization and Rehabilitation (ES&R) and Burn Area Emergency Rehabilitation (BAER) management and post fuels management projects to ensure long term persistence of seeded or pre-burn native plants – which may require temporary or long-term changes in livestock grazing, travel management, etc. – may result in reductions in economic activity relative to Alternative A.

The economic impacts of the management decisions for density and disturbance in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

Mitigation requirements would likely result in increased costs for operators relative to Alternative A because these requirements apply across all nine planning areas. This could impact (reduce) levels of economic activity but more likely operations would remain at the same level and the costs of mitigation actions would result in increased levels of economic activity.

Restrictions on timing and distance of surface disturbance and surface occupancy are partly encompassed in the quantitative analysis in Section 4.11.4. These restrictions would have various additional impacts; e.g., use of directional drilling to access fluid mineral resources under NSO areas, or changes to operators' practices for accessing sites. The net economic impacts relative to Alternative A cannot be determined as the restriction standards are substantially different than those used in Alternative A.

Limiting noise to less than 10 decibels above ambient measures (20-24 dBA) at sunrise at the perimeter of a lek during active lek season may result in some changes to operators' practices or require additional actions that would result in costs for operators. This is a substantially different standard than that used in Alternative A; therefore, the relative economic impacts cannot be determined.

Impacts to Non-market Values

Non-market values associated with recreation would be similar to those in Alternative A, but may be different in composition. Consumer surplus values associated with non-motorized recreation may increase somewhat because this alternative provides more protection to the open spaces that these recreationists value. Consumer surplus values for motorized recreationists (OHV users) who appreciate availability of open areas may decrease relative to Alternative A because Alternative B changes some currently open areas to limited to designated roads and trails.

Non-market values associated with livestock grazing may decrease in this alternative relative to Alternative A. Some of this alternative's management actions would result in increased costs to operators, or changes in operational practices. These changes may impact ranchers' abilities to maintain their livelihoods and the customs and culture of ranching, which could impact the non-market values of livestock grazing.

Non-market values associated with Greater Sage-Grouse populations would probably increase under this alternative compared to Alternative A (or experience fewer adverse impacts), because populations of sage-grouse are more likely to be maintained or enhanced due to this alternative's greater focus on conservation.

Ecosystem service non-market values would be greater under this alternative than Alternative A. This alternative's greater focus on habitat conservation and lower levels of resource development would be more likely to support higher levels of ecological and other natural functions that provide various ecosystem services.

Economic Impacts of Alternative C

Based on restrictions to surface disturbing and disruptive activities, limitations on density of disturbance, and unavailability of sensitive resource areas for oil and gas leasing, the RFD scenario for Alternative C projects the drilling of 8,617 oil, gas, and CBNG wells on federal mineral estate within sage-grouse habitat areas between 2013 and 2020. Compared to Alternative A, this would be 3,968 fewer projected wells. The quantifiable economic impacts of this level of oil and gas development, and resulting oil and gas production, are presented in Section 4.11.4.

Wind energy development and production activity under Alternative C would be the same as that projected under Alternative B. Therefore, the economic impacts would be the same as for Alternative B. The quantifiable economic impacts are presented in Section 4.11.4.

Sage-grouse habitat management on livestock grazing are presented in Section 4.11.4 for Alternative C. Grazing-related economic activity is less under Alternative C because livestock grazing would be prohibited within sage-grouse priority habitat. Additional qualitative differences in impacts are discussed below.

The quantifiable economic impacts of recreation presented in Section 4.11.4 are the same for each alternative. This is because the differences in management actions affecting recreation cannot be quantified. Qualitative differences in impacts are discussed below.

Some of the quantifiable economic impact of recreation is directly attributable to the presence of sage-grouse in the planning area. To the extent that sage-grouse populations are maintained or enhanced by this alternative, recreation centered on sage-grouse (bird-watching, hunting) would be maintained or enhanced. Economic impacts would be similar to Alternative A. These impacts might be larger or more likely to be maintained under this alternative because of its greater focus on conservation compared to Alternative A and Alternative B.

Additional potential economic impacts from various management actions of this alternative are discussed qualitatively below.

Certain lands and realty management actions may result in further increased costs for project proponents and thus could further affect (increase or decrease) levels of economic activity relative to Alternative A. These include:

- Managing both sage-grouse priority habitat areas and general habitat areas as exclusion areas (subject to some exceptions) for new ROWs and SUAs may result in more costly routing of utilities relative to Alternatives A and B, and further increase utility project costs.

- Not authorizing new transmission corridors in sage-grouse priority and connectivity habitat areas, and relocating or un-designating ROW corridors would further constraint such utility projects relative to Alternative A. This may result in more costly routing of utilities and further increase utility project costs.

- MET tower location restrictions in the Kemmerer and Rawlins Field Offices would result in the same costs as Alternative A.

The economic impact of the level of wind energy development allowed for in this alternative is encompassed in the quantitative analysis in Section 4.11.4.

Retaining public ownership of public land within sage-grouse priority habitat (subject to certain exceptions) may result in reduced disposal of public lands relative to Alternative A and Alternative B. This may result in less economic activity from development or alternative uses of disposed parcels, and/or the generation of property taxes from parcels passing into private ownership may be reduced, while PILTs would be less reduced.

Acquisition of lands and interests in lands in this alternative would reduce property taxes from the acquired parcels but also increase PILTs. However, the impact relative to Alternative A cannot be determined because the relative level of acquisition activity cannot be determined at this time.

The economic impact of the prohibition on livestock grazing in sage-grouse priority habitat is encompassed in the quantitative analysis in Section 4.11.4. The economic impact estimates in that section (the reductions in economic activity) reflect only the reductions in the numbers of AUMs that would no longer be utilized on the allotments that are directly affected by the prohibition. In addition, loss of access to those allotments may impact the ability of the permittees to utilize the remainder of their allotments, and their adjacent private lands. The extent of any such secondary impact cannot be readily determined, and would depend on individual operators' abilities to adjust their operations to address the loss of forage in sage-grouse priority habitat.

The impacts of voluntary relinquishment of grazing privileges would be the same as in Alternative B.

Avoidance of structural range developments and location of supplements may reduce economic activity (reduced spending on these measures) somewhat relative to Alternative A. Management actions setting additional requirements for range development projects (e.g., changes to fences) may result in some cost increases for operators relative to Alternative A.

Management actions for livestock grazing in riparian areas would have similar impacts to Alternative A, but may result in some additional reductions in use and/or changes to practices of grazing operators relative to Alternative A. Not authorizing certain new water developments may reduce economic activity (expenditures for such developments), while modifications to existing water developments may produce new economic activity.

The economic impacts of a number of the minerals management decisions in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

Not allowing for exceptions, waivers, and modifications to minerals lease stipulations, COAs, and T&Cs in sage-grouse priority habitat and general habitat may result in some decreases in economic activity or increases in costs relative to Alternative A and Alternative B.

Not allowing new geophysical exploration in priority and general sage-grouse habitat may reduce economic activity relative to Alternative A and Alternative B. Application of constraints on the methods of exploration may increase costs of some exploration activities relative to Alternative A.

As in Alternative A, mitigation requirements and other COAs may affect operator costs and in certain cases may affect the level of economic activity. However, the impact relative to Alternative A cannot be determined because the exact types and relative levels of requirements and conditions cannot be determined at this time.

The economic impacts of not allowing new surface occupancy on leases within priority habitats would be the same as Alternative B.

Prohibiting the construction of evaporation or infiltration reservoirs to hold coalbed methane wastewater may result in increased costs relative to Alternative A. This would likely be reflected in increased economic activity (expenditures for wastewater management) assuming the increased costs do not result in fewer wells.

The economic impact of the management actions for coal exploration and coal leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed coal exploration activity or lease relative to sage-grouse priority habitat areas.

The economic impact of the management actions for non-energy mineral exploration and leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed non-energy mineral exploration activity or lease relative to sage-grouse priority habitat areas.

The economic impacts of withdrawal of portions of sage-grouse priority habitat from mineral entry for locatable mineral development based on risk to sage-grouse and its habitat, relative to Alternative A, cannot be determined because the effects of this action depend on the location of economically developable locatable mineral resources relative to priority habitat areas and in comparison to the withdrawn areas that would occur under Alternative A.

Closing sage-grouse priority habitat areas to mineral material exploration, sale, and free use permits may reduce economic activity relative to Alternative A; however, substitute areas for mineral materials in many cases may be available outside of priority habitat areas.

Not allowing SRPs and SUAs that do not have neutral or beneficial effects to priority habitat areas may result in some reductions in economic activity relative to Alternative A.

Seasonally prohibiting camping and other non-motorized recreation within four miles of active sage-grouse leks may result in some reductions in economic activity relative to Alternative A.

The economic impacts of designations of sage-grouse ACECs/SIAs are encompassed in the quantitative analysis in Section 4.11.4.

The economic impacts resulting from OHV use in the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area would be the same as Alternative B.

The economic impacts of restrictions on road building (e.g., for oil and gas development) are encompassed in the quantitative analysis in Section 4.11.4.

Not allowing upgrading of certain existing routes in priority and general habitat, and limitations on route alignments, may reduce economic activity (e.g., reduced expenditures on routes, and possibly reductions in activities that would be fostered by upgrades) relative to Alternative A and Alternative B.

A number of management actions in this alternative would generate economic activity due to the resulting expenditures made in the local and state economies, although the level of economic activity from many of these actions would be small relative to the activity generated by resource uses. Relevant management actions include:

- Reclaiming unauthorized, redundant, or unnecessary travel routes – economic impacts would be similar to Alternative A.

- Vegetation treatment and vegetation management projects – economic impacts (activity) relative to Alternative A may be reduced as only treatments that are demonstrated to benefit sage-grouse would be allowed, treatments to increase livestock or big game forage would be avoided, and significant pretreatment data requirements and post-treatment monitoring requirements may reduce the use of treatments.

- Fencing/resting of burn areas – economic impacts (activity) from fencing relative to Alternative A may be reduced as this type of management action is not explicitly included in this alternative. However, economic activity from grazing in these areas may be greater than in Alternative A.

- Reclamation of surface disturbances – economic impacts would be the same as Alternative A.

- Vegetation reclamation standards requiring use of native/genetically local plants or seeds – economic impacts would be similar to Alternative A.

- Economic activity from activities to control outbreaks of grasshoppers and Mormon crickets may be reduced relative to Alternative A as this type of management action is not explicitly included in this alternative.

- Provision of water developments to improve wild horse distribution and manage forage utilization – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.

- Wildland fire fuels management/reduction activities (prescribed burns, mechanical, chemical, and biological treatments) – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.

- Stabilization and restoration activities subsequent to wildland fires – economic impacts (activity) relative to Alternative A may be reduced as this type of management action is not explicitly included in this alternative.

- Woodland encroachment treatments in certain grassland, sagebrush, aspen, and other vegetative communities are not explicitly included in this alternative; thus, economic activity from such treatments may be reduced relative to Alternative A.

Design of post fuels management projects to ensure long-term persistence of seeded or pre-burn native plants – which may require temporary or long-term changes in livestock grazing, travel management, etc. – may result in reductions in economic activity relative to Alternative A.

Restrictions on grazing in burned areas may result in reductions in economic activity relative to Alternative A.

The economic impacts of the management decisions for density and disturbance in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

Mitigation requirements would likely result in increased costs for operators relative to Alternative A because these requirements apply across all nine planning areas. This could impact (reduce) levels of economic activity but more likely operations would remain at the same level and the costs of mitigation actions would result in increased levels of economic activity.

Restrictions on timing and distance of surface disturbance and surface occupancy are partly encompassed in the quantitative analysis in Section 4.11.4. These restrictions would have various additional impacts; e.g., use of directional drilling to access fluid mineral resources under NSO areas, or changes to operators' practices for accessing sites. The net economic impacts relative to Alternative A cannot be determined as the restriction standards are substantially different than those used in Alternative A.

Limiting noise to less than 10 decibels above ambient measures (20-24 dBA) at sunrise at the perimeter of a lek during active lek season may result in some changes to operators' practices or require additional actions that would result in costs for operators. This is a substantially different standard than that used in Alternative A; therefore, the relative economic impacts cannot be determined.

Impacts to Non-market Values

Non-market values associated with recreation would be similar to those in Alternative B. Most recreation-related management actions are the same. Consumer surplus values for non-motorized recreationists may be somewhat affected (reduced) by the action that would seasonally prohibit camping and other non-motorized recreation within four miles of active sage-grouse leks. However, such changes may be counterbalanced by increases in consumer surplus based on the appreciation of some recreationists for the increased protections in this alternative for the open spaces they value (i.e., because the lowest levels of resource development would occur in this alternative).

Non-market values associated with livestock grazing are likely to be less under this alternative than Alternative A or the other alternatives. The prohibition on livestock grazing within sage-grouse priority habitat would reduce grazing-related economic activity from BLM-administered lands and National Forest System lands; thus, the attendant non-market values for those lands would be impacted. In addition, loss of access to those allotments may impact the ability of the permittees to utilize the remainder of their allotments, and their adjacent private lands. To the extent that overall operations are affected and ranchers cannot adjust their operations to make up for the loss of the forage in sage-grouse priority habitat, the non-market values associated with some of the ranches in the planning area could be negatively impacted.

Non-market values associated with Greater Sage-Grouse populations are likely to be higher under this alternative compared to Alternative A, and to be highest under this alternative, because populations of sage-grouse are more likely to be maintained or enhanced due to this alternative's greater focus on conservation. Many of the same conservation decisions are found in this alternative as in Alternative B, but with broader application (e.g., in general habitat areas as well as priority/core habitat areas) and a variety of additional decisions are also likely to be more protective of sage-grouse habitat, thus helping maintain or enhance non-market values associated with Greater Sage-Grouse.

Ecosystem service nonmarket values would be greater under this alternative than Alternative A and highest among the alternatives. This alternative's greater focus on habitat conservation and lower levels of resource development would be more likely to support higher levels of ecological and other natural functions that provide various ecosystem services.

Economic Impacts of Alternative D

Based on restrictions to surface disturbing and disruptive activities, limitations on density of disturbance, and areas closed to oil and gas leasing, the RFD scenario for Alternative D projects the drilling of 12,112 oil, gas, and CBNG wells on federal mineral estate within sage-grouse habitat areas between 2013 and 2020. Compared to Alternative A, this would 473 fewer projected wells. The quantifiable economic impacts of this level of oil and gas development and resulting oil and gas production are presented in Section 4.11.4.

Based on the assumptions and caveats described in Section 4.11.3, which incorporate limitations on wind development from various decisions, a total of 784 MW of wind energy capacity is projected to be developed on BLM-administered lands and National Forest System lands by 2020 under Alternative D in the low development scenario, and 1,960 MW in the high development scenario. Compared to Alternative A, this would be 219 fewer MW of capacity in the low development scenario, and 547 fewer MW in the high development scenario. The quantifiable economic impacts of these levels of wind power development, and resulting wind energy production, are presented in Section 4.11.4.

The quantifiable economic impacts of sage-grouse habitat management on livestock grazing presented in Section 4.11.4 for Alternative D are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed below.

The quantifiable economic impacts of recreation presented in Section 4.11.4 are the same for each alternative. This is because the differences in management actions affecting recreation cannot be quantified. Qualitative differences in impacts are discussed below.

Some of the quantifiable economic impact of recreation is directly attributable to the presence of sage-grouse in the planning area. To the extent that sage-grouse populations are maintained or enhanced by this alternative, recreation centered on sage-grouse (bird-watching, hunting) would be maintained or enhanced. Economic impacts would be similar to Alternative A. These impacts might not be as large or as likely to be

maintained under this alternative as under Alternative B or Alternative C because its protections for sage-grouse are not as great as under those alternatives.

Additional potential economic impacts from various management actions of this alternative are discussed qualitatively below.

Certain lands and realty management actions may affects costs for project proponents and thus could further affect (increase or decrease) levels of economic activity relative to Alternative A. These include:

- Managing sage-grouse core and connectivity habitat areas as exclusion areas (subject to some exceptions) for new ROWs and SUAs may result in more costly routing of utilities relative to Alternative A and further increase utility project costs.
- Making general sage-grouse habitat areas available for new ROAs and SUAs may result in less costly routing of utilities relative to Alternative A.
- MET tower location restrictions in the Kemmerer and Rawlins Field Offices would result in the same costs as Alternative A.

The economic impact of the level of wind energy development allowed for in this alternative is encompassed in the quantitative analysis in Section 4.11.4.

Retaining public ownership of public land within sage-grouse priority habitat (unless other benefits are determined) would have similar effects as Alternative B.

Acquisition of lands and interests in lands in this alternative would reduce property taxes from the acquired parcels but also increase PILTs. However, the impact relative to Alternative A cannot be determined because the relative level of acquisition activity cannot be determined at this time.

Allowing for determination of a variety of actions to address non-achievement of land health standards and non-conformance with guidelines due to existing grazing would have the same economic impacts as Alternative A.

Management actions related to the design and implementation of livestock grazing strategies as part of the grazing permit renewal process, with some additional consideration for sage-grouse habitat objectives and management considerations, would have similar impacts as Alternative A.

As in Alternative A, voluntary relinquishment of grazing privileges would result in reduced economic activity to the extent that permits or grazing preference are retired. This alternative provides for retirement of up to 15% of voluntarily relinquished grazing preference. However, impacts relative to Alternative A cannot be determined because the actual, relative level of retirement cannot be determined at this time.

Management actions setting various requirements or standards for range development projects would have similar impacts to Alternative A.

Management actions for livestock grazing in riparian areas would have similar impacts to Alternative A; however, impacts relative to Alternative A cannot be determined because the relative types and levels of effects on the practices of grazing operators and planned improvements relative to Alternative A cannot be determined at this time.

The economic impacts of a number of the minerals management decisions in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

The economic impacts of allowing exceptions, waivers, and modifications to minerals lease stipulations, COAs, and T&Cs on a case-by-case would be similar to Alternative A.

The economic impacts of geophysical exploration would be the same as Alternative A.

As in Alternative A, mitigation requirements and other COAs may affect operator costs and in certain cases may affect the level of economic activity. However, the impact relative to Alternative A cannot be determined because the exact types and relative levels of requirements and conditions cannot be determined at this time.

The economic impact of the management actions for coal exploration and coal leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed coal exploration activity or lease relative to sage-grouse core and connectivity habitat areas.

The economic impact of the management actions for non-energy mineral exploration and leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed non-energy mineral exploration activity or lease relative to sage-grouse core and connectivity habitat areas.

The economic impacts of withdrawal of portions of sage-grouse core and connectivity habitat from mineral entry for locatable mineral development would be the same as Alternative A.

Economic impacts from outdoor recreation management would be similar to Alternative A.

The economic impacts resulting from OHV use in the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area would be the same as Alternative A.

The economic impacts of avoidance of surface disturbance or occupancy in certain areas (e.g., for road building for oil and gas development) are encompassed in the quantitative analysis in Section 4.11.4.

Allowing upgrading of routes in core, connectivity, and general habitat based on other resource uses would have similar economic impacts to Alternative A.

A number of management actions in this alternative would generate economic activity due to the resulting expenditures made in the local and state economies, although the level of economic activity from many of these actions would be small relative to the activity generated by resource uses. Relevant management actions include:

- Reclaiming unauthorized, redundant, or unnecessary travel routes – economic impacts (activity) would be reduced relative to Alternative A as only allowing natural deterioration of such routes is explicitly included in this alternative.

- Vegetation treatment and vegetation management projects – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.

- Fencing/resting of treated areas – economic impacts (activity) from fencing relative to Alternative A would not occur as treated areas would not be rested. However, economic activity from grazing in these areas would be greater than in Alternative A.

- Reclamation of surface disturbances – economic impacts would be the same as Alternative A.

- Vegetation reclamation standards requiring use of native/genetically local plants or seeds – economic impacts would be similar to Alternative A.

- Economic activity from activities to control outbreaks of grasshoppers and Mormon crickets would likely be similar to Alternative A.

- Provision of water developments to improve wild horse distribution and manage forage utilization – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.

- Wildland fire fuels management/reduction activities (prescribed burns, mechanical, chemical, and biological treatments) – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.

- Stabilization and restoration activities subsequent to wildland fires – increased economic activity may be generated relative to Alternative A due to additional emphasis on restoring, recovering, maintaining, and enhancing sage-grouse habitat.

- Woodland encroachment treatments in certain grassland, sagebrush, aspen, and other vegetative communities are not explicitly included in this alternative; thus, economic activity from such treatments may be reduced relative to Alternative A.

The economic impacts of the management decisions for density and disturbance in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

Mitigation requirements would likely result in increased costs for operators relative to Alternative A because these requirements apply across all nine planning areas. This could impact (reduce) levels of economic activity but more likely operations would remain at the same level and the costs of mitigation actions would result in increased levels of economic activity.

The economic impacts of noise limitations would be the same as Alternative A.

Restrictions on timing and distance of surface disturbance and surface occupancy are partly encompassed in the quantitative analysis in Section 4.11.4. These restrictions would have various additional impacts; e.g., use of directional drilling to access fluid mineral resources under NSO areas, or changes to operators' practices for accessing sites. The net economic impacts relative to Alternative A cannot be determined as the restriction standards are substantially different than those used in Alternative A.

Impacts to Non-market Values

Non-market values associated with recreation would be similar to Alternative A under this alternative, because the recreation policies and levels of resource development are very similar.

In this alternative, the non-market values associated with livestock grazing would be similar to Alternative A. Some of this alternative's grazing provisions appear to be less favorable than those of Alternative A, some appear to be more favorable, and some are similar; therefore on an overall basis,

continuation of livestock grazing operations and culture, and their attendant non-market values, would be expected.

Non-market values associated with Greater Sage-Grouse populations would be similar to Alternative A. These values might not be as large or as likely to be maintained under this alternative as under Alternative B or Alternative C because its protections for sage-grouse are not as great as under those alternatives.

Ecosystem service non-market values may be less under this alternative than Alternative A and would likely be less than under the other alternatives. This alternative's greater emphasis on resource development may result in impacts to ecological and other natural functions that provide various ecosystem services.

Economic Impacts of the Proposed Land Use Plan Amendments

Based on restrictions to surface disturbing and disruptive activities, limitations on density of disturbance, and areas closed to oil and gas leasing, the RFD scenario for the Proposed LUP Amendments projects the drilling of 11,482 oil, gas, and CBNG wells on federal mineral estate within sage-grouse habitat areas between 2013 and 2020. Compared to Alternative A, this would 1,103 fewer projected wells. The quantifiable economic impacts of this level of oil and gas development, and resulting oil and gas production, are presented in Section 4.11.4.

Wind energy development and production activity under the Proposed LUP Amendments would be the same as that projected under Alternative B. Therefore, the economic impacts would be the same as for Alternative B. The quantifiable economic impacts are presented in Section 4.11.4.

The quantifiable economic impacts of sage-grouse habitat management on livestock grazing presented in Section 4.11.4 for the Proposed LUP Amendments are the same as for Alternative A. This is because the differences in management actions affecting livestock grazing cannot be quantified. Qualitative differences in impacts are discussed below.

The quantifiable economic impacts of recreation presented in Section 4.11.4 are the same for each alternative. This is because the differences in management actions affecting recreation cannot be quantified. Qualitative differences in impacts are discussed below.

Some of the quantifiable economic impact of recreation is directly attributable to the presence of sage-grouse in the planning area. To the extent that sage-grouse populations are maintained or enhanced by this alternative, recreation centered on sage-grouse (bird-watching, hunting) would be maintained or enhanced. Economic impacts would be similar to Alternative A. These impacts might be larger or more likely to be maintained under this alternative because of its greater focus on conservation compared to Alternative A.

Additional potential economic impacts from various management actions of this alternative are discussed qualitatively below.

Certain lands and realty management actions may affects costs for project proponents and thus could further affect (increase or decrease) levels of economic activity relative to Alternative A. These include:

- Managing PHMAs as avoidance areas for new ROWs and SUAs may result in more costly routing of utilities relative to Alternative A.
- Management of GHMAs for new ROAs and SUAs would have some additional constraints relative to Alternative A, but with very similar impacts.

- MET tower location restrictions and design limitations may result in additional costs relative to Alternative A.

The economic impact of the level of wind energy development allowed for in this alternative is encompassed in the quantitative analysis in Section 4.11.4.

Retaining public ownership of public land within PHMAs (subject to certain exceptions) would have the same effects as Alternative B.

Acquisition of lands and interests in lands in this alternative would reduce property taxes from the acquired parcels but also increase PILTs. However, the impact relative to Alternative A cannot be determined because the relative level of acquisition activity cannot be determined at this time.

Allowing for determination of a variety of actions to address non-achievement of land health standards and non-conformance with guidelines due to existing grazing would have the same economic impacts as Alternative A.

Management actions related to the design and implementation of livestock grazing strategies as part of the grazing permit renewal process, with incorporation of sage-grouse habitat objectives and management considerations, would have similar impacts as Alternative A.

The impacts of voluntary relinquishment of grazing privileges would be the same as in Alternative A.

Management actions setting various requirements or standards for range development projects would have similar impacts to Alternative A.

Management actions for livestock grazing in riparian areas would have similar impacts to Alternative A; however, impacts relative to Alternative A cannot be determined because the relative types and levels of effects on the practices of grazing operators and planned improvements relative to Alternative A cannot be determined at this time.

The economic impacts of a number of the minerals management decisions in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

The economic impacts of allowing exceptions, waivers, and modifications to minerals lease stipulations, COAs, and T&Cs on a case-by-case would be similar to Alternative A (and the same as Alternative D).

The economic impacts of geophysical exploration would be similar to Alternative B.

As in Alternative A, mitigation requirements and other COAs may affect operator costs and in certain cases may affect the level of economic activity. However, the impact relative to Alternative A cannot be determined because the exact types and relative levels of requirements and conditions cannot be determined at this time.

The economic impact of the management actions for coal exploration and coal leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed coal exploration activity or lease relative to PHMAs.

The economic impact of the management actions for non-energy mineral exploration and leasing relative to Alternative A cannot be determined, because the effects of the actions are highly dependent on the location of any proposed non-energy mineral exploration activity or lease relative to PHMAs.

The economic impacts of the proposed withdrawal of portions of PHMAs from mineral entry for locatable mineral development based on risk to sage-grouse and its habitat, relative to Alternative A, cannot be determined because the effects of this action depend on the location of economically developable locatable mineral resources relative to PHMAs and in comparison to the withdrawn areas that would occur under Alternative A.

Mitigation requirements for locatable mineral development may increase costs for operators relative to Alternative A.

Salable mineral activities in PHMAs may be somewhat more restricted than in Alternative A; however, suitable substitute areas may often be available outside of PHMAs, or within PHMAs (core only) but meeting criteria analyzed in the Density and Disturbance Calculation Tool (DDCT) process. The overall differences in economic impacts from Alternative A are likely to be small.

Economic impacts from outdoor recreation management would be similar to Alternative A.

The economic impacts resulting from OHV use in the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area would be similar to Alternative B.

The economic impacts of avoidance of surface disturbance or occupancy in certain areas (e.g., for road building for oil and gas development) are encompassed in the quantitative analysis in Section 4.11.4.

Policies regarding upgrading of routes in PHMAs, alignments, and road standards are somewhat more restrictive than Alternative A and could somewhat reduce economic activity (expenditures on upgrades, and possibly reductions in economic activity fostered by upgrades).

A number of management actions in this alternative would generate economic activity due to the resulting expenditures made in the local and state economies, although the level of economic activity from many of these actions would be small relative to the activity generated by resource uses. Relevant management actions include:

- Reclaiming unauthorized, redundant, or unnecessary travel routes – economic impacts would be similar to Alternative A.
- Vegetation treatment and vegetation management projects – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.
- Fencing/resting of treated areas – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.
- Reclamation of surface disturbances – economic impacts would be the same as Alternative A.
- Vegetation reclamation standards requiring use of native/genetically local plants or seeds – economic impacts would be similar to Alternative A.
- Economic activity from activities to control outbreaks of grasshoppers and Mormon crickets would likely be similar to Alternative A.

- Provision of water developments to improve wild horse distribution and manage forage utilization – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.

- Wildland fire fuels management/reduction activities (prescribed burns, mechanical, chemical, and biological treatments) – economic impacts relative to Alternative A cannot be determined due to lack of specific comparative information in this planning level action.

- Stabilization and restoration activities subsequent to wildland fires – increased economic activity may be generated relative to Alternative A due to additional emphasis on restoring, maintaining, and enhancing sage-grouse habitat.

- The economic impacts of woodland encroachment treatments in certain grassland, sagebrush, aspen, and other vegetative communities would be the same as Alternative A.

Design of post ES&R and BAER management and post fuels management projects to ensure long-term persistence of seeded or pre-burn native plants – which may require temporary or long-term changes in livestock grazing, travel management, etc. – may result in reductions in economic activity relative to Alternative A.

The economic impacts of the management decisions for density and disturbance in this alternative are encompassed in the quantitative analysis in Section 4.11.4.

Mitigation requirements would likely result in increased costs for operators relative to Alternative A because these requirements apply across all nine planning areas. This could impact (reduce) levels of economic activity but more likely operations would remain at the same level and the costs of mitigation actions would result in increased levels of economic activity.

Noise limitation actions under this alternative may result in some changes to operators' practices or require additional actions that would result in costs for operators. A substantially different noise standard is used compared to Alternative A, and additional currently unspecified actions may occur; therefore, the relative economic impacts cannot be determined.

Restrictions on timing and distance of surface disturbance and surface occupancy are partly encompassed in the quantitative analysis in Section 4.11.4. These restrictions would have various additional impacts; e.g., use of directional drilling to access fluid mineral resources under NSO areas, or changes to operators' practices for accessing sites. The restriction standards are substantially different than those used in Alternative A; therefore, the actions are not directly comparable in economic terms and the relative economic impacts cannot be determined.

Impacts to Non-market Values

Non-market values associated with recreation would be similar to those in Alternative B; i.e., similar to but somewhat different from Alternative A. Consumer surplus values for non-motorized recreationists would likely increase relative to Alternative A, but may decrease for some motorized recreationists.

The non-market values associated with livestock grazing in this alternative would be similar to Alternative A. Some of this alternative's grazing provisions appear to be less favorable than those of Alternative A, some appear to be more favorable, and some are similar; therefore on an overall basis, continuation of livestock grazing operations and culture, and their attendant non-market values, would be expected.

Non-market values associated with Greater Sage-Grouse populations may be somewhat higher under this alternative than Alternative A due to the additional protections under this alternative. These values might not be as large or as likely to be maintained under this alternative as under Alternative B or Alternative C because its protections for sage-grouse are not as great as under those alternatives.

Ecosystem service non-market values may be somewhat higher under this alternative than Alternative A due to the additional protections under the Proposed LUP Amendments that would help support ecological and other natural functions that provide various ecosystem services. These values might not be as large under this alternative as under Alternative B or Alternative C because the protections for sage-grouse habitat and limitations on development are not as great as under those alternatives.

4.11.6 Social Impacts

In general, social impacts of BLM and Forest Service management actions are of two primary types:

- Social impacts driven by economic impacts – For instance, such impact may occur when changes in employment due to management decisions lead to changes in population that drive impacts to housing, schools, community services, crime, community cohesion, etc.

- Social impacts that are more purely social and cultural in nature – These include impacts on intangible aspects of quality of life, attitudes and beliefs, traditional land uses and associated cultural values, and so on.

Regarding social changes driven by economic impacts, major economic changes are underway in Wyoming due to two resource development trends that both affect BLM-administered lands and National Forest System lands and are affected by BLM and Forest Service management decisions. These trends are the rapid development of oil and gas resources across many parts of the state, and the rapid development of wind energy resources in some locations.

With respect to development of oil and gas resources, in some locations the rapid pace of development has driven important social changes, due to the influx of people to these areas who find employment in the oil and gas industry and ancillary service industries. For instance, the Final EIS for the Proposed RMP of the Pinedale Field Office, prepared in August 2008, documented a variety of changes underway in this field office – within Sublette County in particular – that are attributed to rapid population growth (temporary and permanent residents) brought on by the oil and gas boom. These changes include stresses on community resources such as educational infrastructure, and impacts to community cohesiveness as newcomers bring value systems and mores that differ from those endemic to the region.

The pace of oil and gas development in the Pinedale Field Office, and across the entire planning area for this planning action, slowed considerably during the recent recession compared to the pace in the mid-2000s. Recently the pace of development has picked up, and very robust levels of development are anticipated in the RFD for this planning effort.

Table 4-104 shows the absolute and relative levels of oil and gas well drilling projected in the RFD, by alternative, for the 2013 to 2020 period – the period used in the economic impact analyses in Section 4.11.4.

Table 4-104. Total Wells Drilled on Federal Mineral Estate in Sage-Grouse Habitat from 2013 to 2020, by Alternative

	Baseline*	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Total Wells Drilled**	13,469	12,585	10,712	8,617	12,112	11,482

	Baseline*	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Annual Wells Drilled**	1,684	1,573	1,339	1,077	1,514	1,435
Total Difference from Baseline	N.A.	-884	-2,757	-4,853	-1,357	-1,987
Total Difference from Alt. A	N.A.	N.A.	-1,873	-3,968	-473	-1,103

N.A.: Not Applicable
*Projected baseline well counts assuming lands are available for leasing with no significant restrictions on drilling.
**Includes oil and gas wells and CBNG wells.
Source: RFD.

According to the RFD, all the alternatives considered in this planning effort would reduce the number of wells that would be drilled and completed on federal mineral estate in the planning area, relative to development that would occur without significant restrictions on drilling. Alternatives B through E would also reduce the number of wells drilled relative to Alternative A.

To the extent these reductions occur in areas where rates of development would otherwise drive the types of social impacts noted above for the Pinedale Field Office, these impacts may be reduced. However, depending on oil/gas field configurations, well-drilling technology, and availability of non-federal mineral estate, in some areas oil and gas development may simply shift from federal mineral estate to non-federal mineral estate. Determining the degree of such shifts in activity – and whether current trends in social impacts would be altered – requires considerably more information on the plans of and options available to oil and gas developers than is available for this planning level EIS.

In places where high rates of development would drive social impacts, and oil and gas development would not simply shift to non-federal mineral estate in the face of various BLM and Forest Service management decisions, reductions in social impact would be most likely under Alternatives B and C, given the degree of reductions to oil and gas development under these alternatives. In fact, the RFD anticipates that some non-federal mineral estate also may be affected by the decisions in these two alternatives, leading to further reductions in the total wells drilled within sage-grouse habitat for 2013 to 2020 of 483 wells in Alternative B and 497 wells in Alternative C. The RFD does not project reductions in drilling on non-federal mineral estate in Alternatives A, D, or E.[3]

As shown in Table 4-104, the reductions in total wells drilled from 2013 to 2020 compared to the baseline scenario are much lower in Alternatives A and D, and somewhat lower in the Proposed LUP Amendments, than in Alternatives B and C. It is likely that reductions in the social impacts of high levels of development would not be as significant under these alternatives as under Alternatives B and C.

Reductions in the social impacts of high levels of development depend in the first place on whether the rate of development in the baseline scenario would be likely to induce such impacts. This depends on local rates of development, the locations of development relative to communities, and the capacity of communities to absorb increased demand on infrastructure and social patterns.

Detailed inspection of the RFD shows that by far the largest amount of drilling from 2013 to 2020 is expected in the Pinedale Field Office – 5,679 wells under the baseline scenario, and 5,066 wells under Alternative A (42% and 40% of the total wells across the planning area, respectively). As noted above, the

[3] *While the RFD addresses reductions on non-federal mineral estate in sage-grouse habitat areas, it does not address shifts from federal to non-federal mineral estate within sage-grouse habitat areas, or shifts from within to outside of sage-grouse habitat areas.*

Pinedale Field Office is known to have experienced stresses on community resources and community cohesiveness from high rates of development in the past. The rates of development projected in the RFD for the Pinedale Field Office are likely to induce these types of impacts in the future. These impacts are likely to be most significant under Alternatives A and D and the Proposed LUP Amendments, and may be reduced to some degree under Alternative B and particularly under Alternative C, which has a reduction of 1,428 wells compared to the baseline and 815 wells compared to Alternative A.

The next largest amount of drilling occurs in the Rawlins Field Office – 3,325 wells under the baseline scenario, and 3,172 wells under Alternative A. This level of development would probably induce some stresses on community resources and community cohesiveness. Reductions in these rates of development are significant (between 529 and 1,532 wells) for Alternatives B and C, which would probably result in some reductions in social impacts.

Three other BLM field offices have more than 1,000 wells projected from 2013 to 2020 under the baseline scenario: the Casper Field Office (1,601 wells), Rock Springs Field Office (1,215 wells), and Kemmerer Field Office (1,023 wells). These levels of development may result in some stresses on community resources and social cohesiveness. Well drilling is reduced by over 500 wells in the Casper Field Office in Alternatives B and C; reductions in the other two field offices are less.

The amount of well drilling from 2013 to 2020 is considerably lower in the remaining field offices and planning units. Social impacts due to stresses on community resources and social cohesiveness are less likely in these field offices and planning units under any of the alternatives.

With respect to wind energy development, large wind farm projects can result in significant short-term increases in employment, which can produce similar stresses on community resources and social cohesiveness to those stresses seen with large-scale oil and gas development. Whether these impacts would occur would depend on the levels of wind energy development, the locations of such developments relative to communities, and the capacity of communities to absorb the demand on infrastructure and social patterns. If such impacts occur, they would occur in areas around a relatively small number of large wind farm projects. The locations of these projects cannot be reliably determined at this time. Based on the projected amount of wind development, these types of impacts would be more likely under Alternative A, and to some degree Alternative D. The amount of wind development on BLM-administered lands and National Forest System lands in Alternatives B and C and the Proposed LUP Amendments is considerably less – social impacts from the levels of development are less likely or would be less pronounced.

Regarding social changes that are more purely social and cultural in nature, the five high-level stakeholder categories identified and described in the Attitudes and Beliefs section of the Socioeconomic Baseline Report are used below to assess key social impacts the five alternatives. Stakeholders have distinct sets of attitudes, beliefs, values, opinions, and perceptions about public lands and the effects of various management policies and actions. These views reflect different cultural and economic linkages people have to public lands. By looking at the alternatives from different points of view, one can identify potential social and cultural impacts on each stakeholder group. The categorization of stakeholders is not meant to imply that all individuals and social groups fit neatly into a single category; many specific individuals or organizations may have multiple interests and would see themselves reflected in more than one stakeholder category. The point of the categories used here is to allow differentiation of social impacts based on broad differences in sociocultural linkages to public lands and associated points of view.

Social Impacts of Alternative A

Based on the analysis presented at the beginning of this section, social impacts driven by economic changes, such as stresses on community resources and community cohesiveness from high rates of resource development, would be highest under Alternative A.

Wildlife/Ecosystem Conservation Stakeholders would find this alternative unsatisfactory. These stakeholders believe protecting species and ecosystems is a fundamental social value, and is not sufficiently accomplished by the current policies carried forward by this alternative. They would view this alternative as leading to the long-term demise of sage-grouse populations and habitats.

Mineral Development Stakeholders would generally find this alternative to be most favorable to their interests and values, and to maintenance of the mineral development economy and culture. This alternative has the highest level of projected oil and gas development of all the alternatives. In addition, it carries forward policies that these stakeholders are very familiar with and have largely incorporated into their costs of business.

Renewable Energy Development Stakeholders would generally find this alternative to be most favorable to their interests. This alternative has the highest level of projected wind development of all the alternatives. In addition, it carries forward policies that these stakeholders are very familiar with and have largely incorporated into their costs of business.

Livestock Grazing Stakeholders would generally find this alternative to be most favorable to their interests. It carries forward policies that these stakeholders are very familiar with and have largely incorporated into their costs of business.

Recreation Stakeholders would generally find this alternative favorable, largely because it carries forward policies that some of these stakeholders are very familiar with. Commercial recreation operators who use BLM SRPs or the Forest Service Recreation Special Use Authorizations (RSUA) have largely incorporated these policies into their costs of business. Recreation stakeholders who value sage-grouse (e.g., some hunters and birdwatchers) or intact ecosystems may not favor this alternative because it does less to protect sage-grouse and their habitats than the other alternatives.

Social Impacts of Alternative B

Based on the analysis presented at the beginning of this section, social impacts driven by economic changes, such as stresses on community resources and community cohesiveness from high rates of resource development, would probably be reduced in Alternative B relative to Alternative A.

Wildlife/Ecosystem Conservation Stakeholders would see this alternative as more favorable to their interests and values than Alternative A. This alternative has lower levels of projected mineral development and wind energy development (e.g., because priority sage-grouse habitat would be closed to new fluid mineral leasing, and due to a limitation on anthropogenic disturbances to less than 3% of total sage-grouse habitat). It also has stronger operational constraints such as various decisions for avoidance of and restrictions on surface-disturbing and disruptive activities during certain hours and certain seasons, which these stakeholders would see as more protective of sage-grouse. These stakeholders would find additional decisions to be favorable as well, such as managing sage-grouse priority habitat areas as exclusion areas for new BLM ROW or Forest Service SUA permits; prohibiting new above-ground transmission structures in sage-grouse priority and connectivity habitat areas; and finding unsuitable all surface mining of coal in priority habitat areas. While these stakeholders would see this alternative as more in line with the species and ecosystem protection values they believe government and society should follow, some in this category would believe this alternative does not go far enough.

Mineral Development Stakeholders would see this alternative as less favorable to their interests and values than Alternative A. Based on the lower level of resource development projected in this alternative, and the additional operational and other restrictions noted in the previous paragraph, these stakeholders would see this alternative as providing smaller economic benefits at the national, state, and local level, and also less support to long-standing mining customs and culture in Wyoming. They would also believe that this alternative fails to take adequate advantage of Wyoming's mineral resources to reduce reliance on foreign energy sources.

Renewable Energy Development Stakeholders would find this alternative to be very unfavorable to their interests. Compared to Alternative A, this alternative has a greatly reduced level of projected wind development due to significant constraints imposed by a number of its management actions, including managing sage-grouse priority habitat areas as exclusion areas for new BLM ROW or Forest Service SUA permits, and various restrictions that would make development of new electricity development lines more difficult or uneconomical. These stakeholders would believe this alternative will result in Wyoming missing many opportunities to develop an emerging industry they see as environmentally sustainable and highly beneficial to local communities and the economy and culture of the state as a whole.

Livestock Grazing Stakeholders would find this alternative less favorable than Alternative A. In terms of the quantitative economic impact estimates, this alternative generates the same amount of economic activity as Alternative A; however, some of its management actions would result in increased costs to operators, or changes in operational practices that could alter long-time customs associated with livestock grazing. These stakeholders would see this alternative as less conducive to their abilities to maintain their livelihoods and the customs and culture of ranching, and thus would also be concerned that this alternative could impact the long-term viability of maintaining livestock grazing as an important part of the traditions and economies of local communities.

Recreation Stakeholders may have somewhat divergent views on this alternative. Non-motorized recreationists would see this alternative similarly to Alternative A or would favor it because it provides more protection to the open spaces that these recreationists value. Some commercial recreation operators may have some concerns with this alternative because in priority habitat areas it would only allow BLM SRPs or Forest Service RSUAs that have neutral or beneficial effects to priority habitat areas. Motorized recreationists (OHV users) who appreciate availability of open areas may find this alternative less favorable to Alternative A because it changes some currently open areas to limited to designated roads and trails.

Social Impacts of Alternative C

Based on the analysis presented at the beginning of this section, social impacts driven by economic changes, such as stresses on community resources and community cohesiveness from high rates of resource development, are likely to be reduced in Alternative C relative to Alternative A, and would be lowest in this alternative compared to any other alternative.

Wildlife/Ecosystem Conservation Stakeholders would see this alternative as more favorable to their interests and values than Alternative A, and as the most favorable of all the alternatives. This alternative has the lowest levels of projected mineral development and wind energy development, which these stakeholders would favor due to fewer impacts on sage-grouse and other wildlife and their habitats. They would approve of the use of many of the same decisions found Alternative B, while favoring the broader application compared to Alternative B (e.g., in general habitat areas as well as priority/core and connectivity habitat areas) of various decisions, including operational constraints. These stakeholders would find a variety of additional decisions to be favorable as well, such as increasing designation of sage-grouse conservation ACECs/SIAs; prohibiting new road construction within four miles of active sage-grouse leks; prohibiting most geophysical exploration activity within priority and general sage-grouse habitat; and

implementing a variety of additional restrictions and conservation activities aimed at protecting and enhancing sage-grouse populations and habitats. Some within this stakeholder group would favor this alternative's prohibition on grazing within priority habitat areas.

Mineral Development Stakeholders would see this alternative as less favorable to their interests and values than Alternative A, and as the least favorable of all the alternatives. Based on the lower level of resource development projected in this alternative, and additional operational and other restrictions, these stakeholders would see this alternative as providing the smallest economic benefits at the national, state, and local level, and also providing the least support to long-standing mining customs and culture in Wyoming. In addition, they would believe that this alternative fails to take adequate advantage of Wyoming's mineral resources to reduce reliance on foreign energy sources.

Renewable Energy Development Stakeholders would view this alternative very similarly to Alternative B, as its management actions lead to the same greatly reduced level of wind energy development compared to Alternative A.

Livestock Grazing Stakeholders would find this alternative much less favorable than Alternative A. This view would be based, particularly, on the prohibition on grazing within priority habitat areas. As a result of that management action, the amount of economic activity generated from livestock grazing in this alternative would be considerably reduced compared to Alternative A (43% at the state-wide level, and more or less for specific field offices and planning units). Thus, these stakeholders would see this alternative as directly harmful to their abilities to maintain their livelihoods and the customs and culture of ranching, and they would also be concerned that this alternative would impact the long-term viability of maintaining livestock grazing as an important part of the traditions and economies of local communities. In addition, some of the management actions of Alternative C would result in increased costs to operators, or changes in operational practices that could alter long-time customs associated with livestock grazing.

Recreation Stakeholders would view this alternative similarly to Alternative B. Most recreation-related management actions are the same. Some non-motorized recreationists may be concerned with the action that would seasonally prohibit camping and other non-motorized recreation within 4 miles of active sage-grouse leks. However, these concerns may be counterbalanced by the appreciation of some recreationists for the increased protections in this alternative for the open spaces they value (i.e., because the lowest levels of resource development would occur in this alternative).

Social Impacts of Alternative D

Based on the analysis presented at the beginning of this section, social impacts driven by economic changes, such as stresses on community resources and community cohesiveness from high rates of resource development, would be similar to Alternative A.

Wildlife/Ecosystem Conservation Stakeholders would find this alternative unsatisfactory. They would see this alternative as more favorable to resource development than the other alternatives (possibly excepting Alternative A) and would believe that this favorability to development is contradictory to the need to protect and recover sage-grouse populations. While they would see some decisions within Alternative D as providing some possibility for improved protection of sage-grouse compared to Alternative A, they would see this alternative in general as not sufficiently protective against the long-term demise of sage-grouse populations and habitats.

Mineral Development Stakeholders would find this alternative very conducive to their interests and values. While Alternative A has a somewhat higher projected level of oil and gas development, and thus would be favored by many members of this stakeholder group, some members would find Alternative D more attractive because it provides for consistent policies across the entire planning area, as opposed to the

patchwork of policies now in place across the nine field offices and planning units. In addition to being consistent, the policies in this alternative are generally much more favorable to mineral development than those under Alternatives B and C, and somewhat more favorable than those under the Proposed LUP Amendments. This group would see Alternative D as providing ample opportunity to derive benefits from mineral development that support their livelihoods and the economies of local communities, the state, and nation, and would see this alternative as allowing for continuation of the mineral development traditions and customs of many Wyoming residents and communities.

Renewable Energy Development Stakeholders would find this alternative to be less favorable than Alternative A, and more favorable than Alternatives B, C, or E. This alternative has a lower level of projected wind development than Alternative A, and a higher level than Alternatives B, C, or E. While they would not view Alternative D as negatively as Alternatives B, C, or E, renewable energy development stakeholders would believe this alternative will result in Wyoming missing some opportunities to develop an emerging industry they see as environmentally sustainable and highly beneficial to local communities and the economy and culture of the state as a whole.

Livestock Grazing Stakeholders would view this alternative similarly to Alternative A. In terms of the quantitative economic impact estimates, this alternative generates the same amount of economic activity as Alternative A. In qualitative terms, some of its grazing provisions appear to be less favorable than those of Alternative A, some appear to be more favorable, and some are similar.

Recreation Stakeholders would view Alternative D similarly to Alternative A; the recreation policies and levels of resource development are very similar.

Social Impacts of the Proposed Land Use Plan Amendments

Based on the analysis presented at the beginning of this section, social impacts driven by economic changes, such as stresses on community resources and community cohesiveness from high rates of resource development, would be similar to Alternative A. In some localized areas, such social impacts might be reduced in the Proposed LUP Amendments compared to Alternative A.

Wildlife/Ecosystem Conservation Stakeholders would find this alternative more favorable than Alternative A or D, but less favorable than Alternative B or C. This view would be based in part on the lower level of oil and gas development compared to Alternative A or D, and in part on the more discretionary nature of many of the decisions in the Proposed LUP Amendments compared to the generally more prescriptive decisions of Alternative B or C. Many of the management actions in this alternative would involve the BLM or the Forest Service making decisions by applying various criteria, evaluating and considering certain courses of action, designing and implementing certain actions to emphasize certain results, working with permittees to incorporate certain objectives and management considerations, etc. Many of these stakeholders would believe that the effectiveness of this alternative for protecting and enhancing sage-grouse population and habitats will depend on how it's more discretionary approach is implemented.

Mineral Development Stakeholders would view this alternative less favorably than Alternatives A and D, and more favorably than Alternatives B and C, largely due to the relative levels of projected oil and gas development across the alternatives. These stakeholders would appreciate some of the more discretionary aspects of the management actions in this alternative, which would allow them to work with the BLM and Forest Service to find paths forward for projects that develop mineral resources, while not unduly impacting sage-grouse populations and habitats; but they would likely prefer the known regulatory environment of Alternative A or the generally more development-favorable policies of Alternative D. Given the lower level of projected development in this alternative compared to Alternatives A or D, these stakeholders would

believe this alternative will result in Wyoming missing some opportunities to take advantage of mineral resources to support their livelihoods as well as the economies of local communities, the state, and the Nation, and to support national energy supplies.

Renewable Energy Development Stakeholders would view this alternative very similarly to Alternative B, as its management actions lead to the same greatly reduced level of wind energy development compared to Alternative A.

Livestock Grazing Stakeholders may view this alternative somewhat less favorably than Alternative A. In terms of the quantitative economic impact estimates, this alternative generates the same amount of economic activity as Alternative A. In qualitative terms, some of its grazing provisions are the same as or similar to Alternative A (and also Alternative D), some appear to be more favorable, and several appear to be less favorable. For example these stakeholders may be concerned about the management action to incorporate, within PHMAs and as appropriate, site-specific sage-grouse habitat objectives and management considerations into all BLM grazing allotments through AMPs, permit renewals, and/or equivalent planning processes. They may also be concerned about meeting grazing guidelines on National Forest System lands that retain residual upland perennial grass heights of 7 inches during breeding and nesting season, and 4 inches in the remainder of the year.

Recreation Stakeholders may have somewhat divergent views on this alternative. In general, these stakeholders may favor this alternative over Alternative A due to its somewhat lower level of resource development, which would help protect the open spaces they value. Commercial recreation operators would probably see its policies on BLM SRPs or Forest Service RSUAs as differing from Alternative A in nuance but being similar in practical terms. OHV users would see this alternative as more similar to Alternative B than Alternative A with respect to management of OHV open areas, and thus may favor Alternative A over the Proposed LUP Amendments.

4.11.7 Environmental Justice Impacts

Chapter 3 presents the methodology for screening the socioeconomic study area for potential EJ populations, and the results. Once potential EJ populations are identified, EJ impact analysis consists of determining if the subject populations would experience disproportionately high and adverse environmental or human health effects – as defined by the CEQ and described in Chapter 3 – under one or more of the management alternatives. Environmental health effects may include cultural, economic, or social impacts when those impacts are interrelated to impacts on the natural or physical environment.

Based on the definitions and threshold values noted above, and the data obtained for this study, the following places in the socioeconomic study area were flagged as areas of potential concern from an EJ perspective, for the populations noted:

- Fremont County – based on the population of American Indians/Alaska Natives
- Albany County – based on the population of all ages living in poverty
- Niobrara County – based on the population of 65 years and older living in poverty.

For Fremont County, none of the alternatives would create disproportionately high and adverse environmental or human health effects on the population of American Indians/Alaska Natives. Fremont County is not in the planning area; therefore, the management actions considered in this planning action does not apply to Fremont County. While not in the planning area, this county is included in the socioeconomic study area of the Rock Springs Field Office because firms in Fremont County may provide support to oil and gas development in that Field Office. The management alternatives would reduce the amount of oil and gas development in the Rock Springs Field Office. However, the benefits of oil and gas

development in the Rock Springs Field Office, and therefore the impacts of any reductions, are attenuated in Fremont County since most of the support for oil and gas development in this field office comes from Sweetwater County, not Fremont County. This is shown by employment statistics of the U.S. Bureau of Labor Statistics. In 2010, a total of 3,123 people in Sweetwater County were employed in oil and gas industry sectors, while only 683 people were employed in these sectors in Fremont County.[4] Therefore, it is unlikely that reductions in oil and gas development under any of the alternatives would have disproportionate environmental (economic) impacts on American Indians/Alaska Natives.

For Albany County, none of the alternatives would create disproportionately high and adverse environmental or human health effects on the population of all ages living in poverty. While the alternatives will reduce economic opportunities, for instance through reductions in oil and gas development, any reductions in opportunities would not fall disproportionately on this population compared to other populations. Individuals living in poverty are no more likely to be unemployed due to oil and gas development reductions than individuals in middle class income groups. It is also worth noting that the poverty rate in Albany County is somewhat inflated due to the presence of the University of Wyoming. Students, who typically have very low incomes, are accounted for in poverty rate calculations if they live on-campus, but are included as part of the population in poverty if they live off-campus.

For Niobrara County, none of the alternatives would create disproportionately high and adverse environmental or human health effects on the population of 65 years and older living in poverty. While the alternatives will reduce economic opportunities, for instance through reductions in oil and gas development, any reductions in opportunities would not fall disproportionately on this population compared to other populations. This population would mainly experience indirect benefits from oil and gas development since members of the population are not typically in the labor force; therefore, the benefits to this population of oil and gas development in this county, and therefore the impacts of any reductions, are attenuated.

[4] *The following sectors under the North American Industry Classification System (NAICS) are included: 211 - Oil and Gas Extraction, 213111 - Drilling Oil and Gas Wells, and 213112 - Support Activities for Oil and Gas Operations*

4.12 SOILS

This section presents potential impacts on soils from implementing management actions presented in Chapter 2. Existing conditions concerning soils are described in Chapter 3.

4.12.1 Impact Indicators

Indicators of impacts on soil resources are as follows:

- Amount of land subject to surface disturbance
- Vegetation cover (measured by acres in which vegetation would be removed/degraded or protected/maintained)

4.12.2 Assumptions

The analysis was based on the following assumptions:

- On undisturbed rangelands and forestlands, natural erosion rates are minimal, except in areas that have experienced natural disturbance such as fire, where erosion rates may be elevated in the short-term after the disturbance.
- For the purposes of this analysis, water erosion is the primary mechanism for loss of soil productivity.
- Wind erosion can impact soil productivity in a similar manner as water erosion.
- Eroded soil can be deposited as sediment at any point downslope or can be transported to water bodies such as streams, rivers, lakes, and reservoirs.
- The amount of sediment from upland soil erosion that is transported to streams and other water bodies is dependent on distance to the water body, slope, soil texture, filtering capacity of upland and riparian vegetation, and storm intensity and duration.
- Vegetation removal and surface disturbance are the primary cause of accelerated soil erosion on the uplands.
- The removal of vegetation increases the erosive force of overland water flow, decreases soil strength, reduces infiltration, increases runoff, alters soil structure, and reduces protection of the surface from raindrop impact.
- Vegetation increases soil organic matter, aggregation of soil particles, and soil porosity, all of which increase soil resistance to erosion.
- Soil compaction increases overland flow and subsequent erosion.
- Short-term erosion impacts depend on soil texture and type, porosity and permeability, slope of the land, magnitude and type of disturbance, type of vegetation, and the length of time it takes for the disturbed area to become revegetated with a self-sustaining, perennial plant community.

- Long-term erosion impacts are those impacts that continue after vegetation has become reestablished. They are due in part to changes in the vegetation community but to a greater extent to a surface area that remains void of vegetation, such as pads and roads.

- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.12.3 Alternative A

Surface disturbing activities can result in removal of vegetative cover, soil compaction, reduced infiltration, changes in physical and biological properties, reduction in organic matter content, reduced productivity, and increased erosion rates due to the exposure of soil particles to wind and water. Compaction of soil and changes in vegetative cover increases water runoff and downstream sediment loads and lowers soil productivity, thereby degrading water quality, channel structure, and overall watershed health where disturbances are near, or hydrologically connected to, water bodies.

Surface disturbance restrictions apply to activities related to fluid mineral leasing/oil and gas activities on new leases and have been applied to existing leases (including development of associated infrastructure), development associated with linear and non-linear ROWs (some of which are related to oil and gas, wind energy, and solar energy development and some of which are not), construction of MET towers, development of other leasable minerals and mineral materials, livestock grazing management and range improvements, wildfire, fuels and vegetation treatments, and management activities that require a Special Use Permit.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within sage-grouse core habitats would in turn limit surface disturbance, and maintain vegetation, soil stability, and soil productivity in these areas in the short-term, and no off road travel would be allowed.

Limiting ROWs and transmission projects to designated corridors in some areas would result in increased short-term surface disturbance, soil exposure, and soil erosion as land is cleared and vegetation is removed. The vegetation and soils in these corridors would experience re-disturbance each time a pipeline or power line is added to the corridor, increasing the length of time for soil stability and vegetation reclamation to occur. However, these impacts would be concentrated over a more finite area as opposed to being spread throughout the planning area, increasing habitat fragmentation.

Managing portions of sage-grouse core habitat areas as ROW exclusion areas (285,930 acres) would result in no associated surface disturbing activities in these areas, and managing portions of sage-grouse general habitat areas as ROW avoidance areas (2,460,340 acres) would result in a low likelihood of associated surface disturbance occurring within these areas (Map 2-9). Vegetation removal, soil disturbance, and erosion within these habitats would be reduced, and soil productivity would be maintained by reducing the loss of nutrient-rich topsoil. However, these projects may be shifted outside of habitat areas, which would shift soil impacts and could create instances of increased erosion if these projects occur in areas with sensitive or less stable soils.

Wind energy development activities involve land-clearing and surface disturbances. These actions would remove and disturb vegetation and result in short-term soil erosion and a reduction of soil productivity through the loss of nutrient-rich topsoil, until these areas were stabilized and vegetated. Wind energy development would be available in all sage-grouse core habitat areas, except for 424,820 acres that would be excluded from wind energy development (Map 2-29). Approximately 1,254 2-MW wind turbines are projected to be constructed across the entire planning area. Within the closed areas, the amount of land-

clearing and surface disturbance associated with the development of new wind turbines would be eliminated, which would in turn reduce the amount of overall soil disturbance and vegetation removal, and decrease the amount of soil erosion and runoff.

Authorizing the construction of MET towers in certain areas, and on a case-by-case basis, could result in short-term surface disturbance, vegetation removal, and soil erosion, if authorized. If not authorized, soil erosion, compaction, and loss of productivity activities associated with the construction MET towers would not occur.

Livestock grazing and range improvements involve localized surface disturbance, including vegetation removal and soil compaction, from activities such as concentrated grazing, water development and salt block and mineral supplement placement, and construction of fences. These range improvement activities, such as fence construction, salt block placement, and water development near wildlife habitat and riparian areas would all lead to short-term surface disturbance, and potential long-term surface disturbance in areas where livestock congregate, particularly around salt blocks, which could lead to constant soil compaction and erosion in these areas.

Grazing management practices, including managing lotic and lentic wetland/riparian areas toward properly functioning condition (PFC), and utilization of BLM and Forest Service guidance to evaluate land health standards would all help to enhance and maintain vegetation communities in the long term, which would in turn maintain soil stability and productivity while decreasing soil erosion. Livestock water development projects could result in surface disturbance, but could also alleviate pressure from grazing in riparian areas, which would reduce the amount of erosion caused by grazing, including declines in vegetation and increases in soil erosion and runoff.

Allowing fluid mineral leasing within sage-grouse core habitat areas throughout the planning area, except in areas that are unavailable to leasing (871,780 acres) (Map 2-4), would increase vegetation removal, soil erosion, and runoff. Managing areas with NSO stipulations (40,980 acres) and CSU stipulations (5,015,210) would help to reduce such impacts by limiting surface disturbances in these areas. Under this Alternative, 13,653 oil and gas wells and 2,758 CBNG wells would be anticipated in sage-grouse core habitat areas, resulting in 130,330 acres that would be disturbed over the short-term (before reclamation), and 39,050 acres that would be disturbed over the long-term (after reclamation). Fluid mineral leasing activities would involve land-clearing and surface disturbances, such as the construction of well pads, roads, and pipelines in sage-grouse habitat areas. These actions remove and disturb vegetation, expose soils to the erosive forces of water and wind, and result in soil erosion and reduction of soil productivity through the loss of nutrient-rich topsoil both in the short-term, during construction activities, and in the long-term, as permanent structures, such as well pads, pits, and roads are maintained.

Continuation of exceptions to lease stipulations, COAs, and terms and conditions for sage-grouse on a case-by-case basis throughout the planning area could allow for more surface disturbance from oil and gas development activities overall, unless exceptions are to timing limitation stipulations, in which only the timing of the activity would change. These exceptions would be considered on a case-by-case basis, and would need to be consistent with applicable RMPs, but any additional surface disturbances would lead to both short-term and long-term vegetation disturbance, increased soil erosion and runoff, and loss of soil productivity.

Not applying minimum lease sizes within sage-grouse core habitat areas may result in a greater number of smaller-sized leases within these areas. A greater number of leases could result in a greater amount of surface disturbances, vegetation removal, and subsequent soil erosion and runoff, as well as a loss of soil productivity by reducing the amount of nutrient-rich topsoil. However, actions to minimize impacts to

sensitive resources, including vegetation, could reduce the extent of surface disturbances, which would help maintain vegetation communities, and reduce soil erosion and soil productivity loss.

Mitigation of oil and gas activity would lessen the impacts associated with oil and gas activities, including surface disturbance from construction of wells, well pads, roads, pipelines, and transmission lines. And, requiring reclamation bonds before any drillings or surface disturbing activities occur would help to ensure reclamation is completed, which would allow for reestablishment of vegetation, stabilization of soil, and decrease soil erosion and loss of productivity.

Surface and underground coal operations involve land-clearing, road development, construction of mining facilities, and surface disturbances. Surface coal mining (current or potential) in the Casper, Kemmerer, Pinedale, Rawlins, and Rock Springs Field Offices, and the BTNF and TBNG would remove and disturb vegetation and result in subsequent soil erosion and reduction of soil productivity through the loss of nutrient-rich topsoil. Allowing for coal exploration activities and considering leasing of non-energy leasable minerals within sage-grouse core habitat areas (Map 2-24) would result in disturbance and removal of vegetation and result in subsequent short-term and long-term soil erosion and reduction of soil productivity. The magnitude of long-term soil erosion and reduction of soil productivity from coal exploration activities would depend on the duration of activity, as well as the type of reclamation efforts implemented and how long it would take for disturbed areas to become stabilized and vegetated.

Alternatively, withdrawing portions of core habitat areas from locatable mineral entry (1,892,620 acres; Map 2-19) would decrease the amount of surface disturbing activities associated with mineral entry, thereby maintaining vegetation, soil stability, and soil productivity.

Mineral material exploration, sales, and free use permit operations in sage-grouse habitat areas (except areas that are unavailable), as well as geophysical surveys where allowed, would also lead to surface disturbances that would result in vegetation removal, short-term and long-term soil erosion and reduction of soil productivity (Map 2-14). The magnitude of long-term soil erosion and soil productivity loss from mineral exploration would depend on the duration of activity, as well as the type of reclamation efforts implemented and how long it would take for disturbed areas to become stabilized and vegetated.

Continuing to have salable mineral pits that are not in use remain available for other uses could result in little to no vegetation near the pit, as well as soil compaction and increased soil erosion, particularly during heavy rain events.

Allowing dispersed recreation and special use permits could result in short-term localized surface disturbance, resulting in vegetation removal, soil compaction, soil erosion, and loss of productivity.

Managing the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area within the Casper, Kemmerer, Rawlins, and Rock Springs Field Offices, respectively, as OHV “open” areas would result in short-term and long-term impacts to vegetation and soil conditions. A one-time disturbance resulting from OHV use in these vegetated areas (excluding the “open” sand dune areas devoid of vegetation) could cause physical damage to vegetation by breaking stems and branches and could disturb the soil surface depending on soil conditions, slope, and ground cover. Usually, with a one-time disturbance, plants and disturbed areas recover. However, with repeated use, soil compaction could occur and new trails would be established, resulting in long-term loss of vegetation, soil erosion, and loss of soil productivity. The potential for formation of gullies along trails and roads would also increase with repeated use, which would increase the rate and amount of runoff and soil erosion in the long-term.

Applying vegetation treatment measures and management, including use of prescribed fire, rehabilitation, and restoration measures, resting treated areas in certain locations for two growing seasons, restricting surface disturbance in wintering range, and would maintain and increase the overall health and function of vegetation communities. In riparian areas the loss of vegetation can increase sediment (due to erosion). Fire suppression would be guided by individual field office's fire management plans. A greater acreage of sagebrush may be burned in Alternative A since it is the least restrictive on wildland fire management. As a result, a greater loss of vegetation could occur under Alternative A. This could increase sediment loads in areas that have been burned and experienced heavy vegetation loss. Robust vegetation maintains soil stability and productivity, and reduces soil erosion. Application of these measures could result in short-term vegetation loss and subsequent soil erosion during treatment activities, but would improve vegetation health and help maintain soil stability and productivity over the long-term.

Impacts on soil and water from planned and unplanned wildland fires are complex and involve changes in nutrient cycling, water infiltration and runoff, and erosion potential (Moody et al. 2008; Martin and Moody 2001). Fire-induced increases in runoff and sediment yield from wildlands are generally greatest one to two years following fire (Helvey 1980; Inbar et al. 1998; Robichaud 2005) and are typically reduced to background conditions within 10 years (Robichaud 2000). Research has demonstrated that increases in post-fire runoff and sediment yield decline over time. Recovery of post-burn runoff and erosion rates to pre-fire conditions usually occurs within 5 years on rangeland sites (Wright and Bailey 1982); it depends on burn severity, vegetation recovery, litter deposition, debris recruitment, and soil water repellency (Pierson et al. 2008). Use of heavy equipment during surface-disturbing tactics to suppress fires can compact and displace soil. Also, adverse impacts on soil food webs and aquatic organisms are likely if ammonia-based fire retardant is misapplied. Effective fire prescriptions and post-fire rehabilitation can minimize these impacts.

In the short term, suppressing unplanned fires in areas of excessive fuel buildup can minimize high-severity fires and the associated impacts of vegetation loss and erosion. However, continued suppression of fires can result in increased fuel loading and can increase the risk of high-severity unplanned fires and related soil impacts in the long term.

Closing and reclaiming roads, two-track routes, and trails, and reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a) could result in short-term soil erosion due to surface disturbing activities as part of the reclamation process, but would result in long-term improved vegetation health and function, and subsequent reductions in soil erosion and runoff.

Applying distance prohibitions (68,550 acres) and restrictions (93,580 acres) of surface occupancy and disturbance near occupied sage-grouse leks inside and outside core habitat and connectivity areas would reduce the amount of surface disturbing activities resulting from newly permitted activities (Map 2-1). A reduction in surface occupancy and disturbances would decrease the amount of vegetation removal, soil compaction, and soil erosion associated with surface disturbing activities in these areas, and subsequently maintain the health and productivity of soils in both the short-term and long-term.

Seasonal avoidance of surface disturbing and disruptive activities within sage-grouse nesting and early brood-rearing habitat inside sage-grouse core habitat and connectivity habitat areas, and inside sage-grouse winter concentration areas would decrease the amount of vegetation damage and/or removal occurring, as specific areas would be completely closed to newly permitted activities during this time period. The effects would be short-term during the four months that prohibitions and restrictions are in effect.

4.12.4 Alternative B

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per *BLM Handbook H-1740-2* and *Forest Service Manual 2080* could result in short-term vegetation loss and subsequent soil erosion, but would improve the overall health and function of vegetation communities, compared to Alternative A, which would in turn stabilize soil, reduce soil erosion, and help to maintain soil productivity over the long-term.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as, but not limited to, consolidation of infrastructure to reduce habitat fragmentation and loss, and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, could lessen the amount or area of surface disturbance associated with mineral leasing activities within sage-grouse habitat both inside and outside of priority habitat areas, compared to Alternative A. If the area of surface disturbance is reduced, vegetation removal, soil compaction, soil erosion, and productivity loss would be reduced in the long-term.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within sage-grouse priority habitat would result in impacts to soils similar to Alternative A. However, once travel management planning is complete, any additional routes designated would result in increased soil erosion and compaction, while areas closed to motorized travel would result in a decrease of soil erosion and compaction, as vegetation could be reestablished in these areas.

No new transmission corridors or above-ground transmission structures would be authorized within sage-grouse priority and connectivity habitat areas, both inside and outside existing corridors. Sage-grouse priority habitat areas would be managed as exclusion areas and general habitat as avoidance areas for new BLM ROW or Forest Service SUA permits (Map 2-10). Soils within sage-grouse priority habitat areas would not be impacted, as resulting surface disturbances from utility corridor development would not occur. Relocating corridors outside of priority habitat would result in long-term decreased surface disturbance within the habitat, but could result in greater surface disturbance in areas outside priority habitat, if those corridors are developed.

As a ROW action, wind energy development as discussed under Alternative A would also be excluded inside sage-grouse priority habitat areas (5,033,240 acres) (Map 2-30). This would result in larger prohibited areas, relative to Alternative A. Approximately 127 2-MW wind turbines are projected to be constructed, which would be 90% fewer turbines than under Alternative A. These restrictions would reduce the amount of vegetation removal, soil erosion and runoff, and loss of soil productivity associated with wind energy development activities, compared to Alternative A.

Prohibiting the construction of MET towers in sage-grouse priority habitat areas would further reduce the amount of soil erosion and productivity loss from these activities, compared to Alternative A, because MET towers would be prohibited in sage-grouse priority habitat areas throughout the planning area.

Incorporating a light grazing management strategy in sage-grouse priority habitat would result in restrictions to grazing and associated surface disturbance, with fewer impacts to soils compared to Alternative A. Designing new structural range improvements and locations of supplements in sage-grouse priority habitat to conserve, enhance, or restore sage-grouse habitat and planning and monitoring for invasive species due to these improvements would also reduce the impacts to soils, compared to Alternative A, as a healthy vegetative community would decrease soil erosion and loss of productivity.

Managing riparian areas and wet meadows for PFC or other similar methodology (Forest Service only) within sage-grouse priority habitats would result in impacts to soils similar to Alternative A, because the vegetation communities in these areas would be managed for, thereby maintaining soil productivity and stability. Authorizing new water development in sage-grouse priority habitats for diversion from spring or seep source only when priority sage-grouse habitat would benefit on both upland and riparian habitat from the development or there are no negative impacts to sage-grouse would reduce the extent of impacts to soils, compared to Alternative A, as less water developments would likely be authorized, resulting in less surface disturbance, vegetation removal, and soil erosion. Modifying water developments within sage-grouse priority habitat, including dismantling of water developments could result in short-term impacts to soils from surface disturbance associated with the dismantling. In the long-term, soil conditions may be enhanced where developments are removed, by establishing vegetation, stabilizing the soil, and decreasing erosion and loss of productivity, but these water developments could cause increased disturbance on other areas of the allotments, as the water source will have to be moved, which would impact the soil conditions in these areas in the long-term.

Exceptions to lease stipulations for sage-grouse would not be considered within sage-grouse priority habitat. Vegetation loss and subsequent soil erosion in the planning area would decrease, relative to Alternative A, if potential additional surface disturbances resulting from these exceptions would not occur. However, if exceptions were to timing limitation stipulations, only the timing of the activity would change (not the surface disturbance), resulting in impacts to soils similar to Alternative A.

Priority sage-grouse habitat would be closed to new fluid mineral leasing under this alternative (6,886,890 acres) (Map 2-5), which would be a 32% increase in closed areas compared to Alternative A. Under Alternative B, 11,555 oil and gas wells and 2,154 CBNG wells would be anticipated in sage-grouse priority habitat areas, resulting in 104,050 acres that would be disturbed over the short-term (before reclamation), and 33,530 acres that would be disturbed over the long-term (after reclamation). The number of wells anticipated would be approximately 16% less than the amount of wells anticipated under Alternative A. Activities associated with oil and gas leasing, such as construction of well pads, roads, pipelines, and other surface disturbances would be reduced, as would vegetation removal, soil erosion, and runoff both in the short term and long term. Soil erosion and runoff would continue to decline as existing leases would not be re-offered once they expire.

Not applying minimum lease sizes within sage-grouse priority habitat areas would have the same impacts to soils as discussed under Alternative A.

Allowing geophysical exploration within sage-grouse priority habitat areas would decrease impacts to soils, compared to Alternative A, because associated surface disturbing activities would be restricted to existing roads within sage-grouse priority habitat areas, which would in turn reduce vegetation disturbance and soil destabilization in areas where the exploration occurred.

Applying conservation objectives throughout sage-grouse priority habitat would further reduce soil impacts associated with oil and gas activity, compared to Alternative A, because the objectives would be more intensive, and COAs and minimization of impacts to priority habitat through project design would be applied.

Working with project proponents to site their projects in locations that minimize impacts to sensitive resources would have impacts to soils similar to Alternative A, but to a greater extent within priority habitat areas as there would be additional stipulations applied that would require any development within sage-grouse priority habitat to be placed in the area least harmful to sage-grouse based on vegetation, topography, or other habitat features.

Not allowing new surface occupancy on existing federal fluid mineral leases within priority habitats would maintain vegetation, soil health, and soil productivity. However, surface disturbance could occur if the lease is entirely within priority habitat, in which case a loss of vegetation, and decreased soil stability could occur.

Unitization results in waiving well spacing requirements to achieve better retrieval of the underground resource. Requiring unitization when necessary for proper development and operation of an area within sage-grouse priority habitat could result in more concentrated surface disturbances and subsequent vegetation removal, soil erosion, and loss of productivity in the short-term, with less surface disturbance overall through the unit/leases involved. Requiring a full reclamation bond specific to the site in accordance with 43 CFR 3104.2, 3104.3, and 3104.5 would result in impacts to soils similar to Alternative A.

Finding all surface coal mining unsuitable within sage-grouse priority habitat (Map 2-25) would prohibit surface disturbing activities associated with surface coal mining within all priority habitat in the planning area, as opposed to smaller, specific areas outlined in Alternative A, so impacts to soils would be reduced compared to Alternative A. Additionally, granting no new underground coal mining leases unless all surface disturbances (appurtenant facilities) are placed outside of sage-grouse priority habitat area would decrease the impacts to soils within priority habitat, compared to Alternative A, as no surface disturbing activities could occur. However, this could increase the amount of mining activity and surface disturbance outside priority habitat areas, compared to Alternative A. Additionally, if new facilities associated with existing leases cannot be located outside the sage-grouse priority habitat area, co-locating new facilities or building them to the absolute minimum standard necessary would decrease impacts to soils, when compared to Alternative A, as the surface disturbing activities would be more concentrated, resulting in less vegetation removal, soil compaction, and soil erosion. Also, no coal exploration or leases for other non-energy leasable minerals would be allowed inside sage-grouse priority habitat areas, which would reduce vegetation removal, soil erosion, and loss of productivity from these activities, relative to Alternative A where coal exploration would be allowed within this habitat.

Proposing withdrawal from locatable mineral entry based on risk to the sage-grouse and its habitat from conflicting locatable mineral potential and development would result in impacts to soils similar to Alternative A, except an additional 4,987,000 acres would be withdrawn (Map 2-20), which would significantly increase the extent of these impacts.

Mineral material exploration, sales, and free use permits would be closed in sage-grouse priority habitat areas, subject to valid existing rights (Map 2-15). A reduction in these operations would reduce the amount of associated surface disturbance, and subsequently reduce soil erosion and runoff, compared to Alternative A.

Restoring salable mineral pits no longer in use would decrease impacts to soils compared to Alternative A, because localized vegetation would be established, and soil stability and productivity would increase in the short- and long-term.

Allowing BLM SRPs and Forest Service RSUAs in priority habitat that have neutral or beneficial effects to priority habitat areas would decrease the extent of impacts to soils, compared to Alternative A, in priority habitat, as maintaining soil health and stability would be a neutral or beneficial effect.

Designating all OHV “open” areas within sage-grouse priority habitat areas as limited to designated roads and trails, including the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area, and continuing to manage the sand dune portions of these areas where roads to do not exist as “open,” would result in greater protections to soils, compared to Alternative A, if recreational riders avoided these areas, as vegetation would return, soil stability would improve, and soil erosion would decrease.

Using existing roads within priority habitat and not allowing upgrading of existing routes that would change route category or capacity would maintain soil stability and productivity. However, if new roads are constructed or necessary route upgrades would occur, short-term loss of vegetation and subsequent soil erosion would occur until mitigation efforts were successful in revegetation and soil stabilization. Restoration of roads, primitive roads, and trails not designated in travel management plans within priority habitat would result in similar impacts to Alternative A, but to a larger extent as all priority habitat would be subject to this action.

Management for vegetation composition and structure consistent with ecological site potential and within the reference state to achieve sage-grouse seasonal habitat objectives in sage-grouse priority habitat would increase the overall health and function of vegetation communities, when compared to Alternative A, because a larger area of the planning area would be managed. Measures to maintain sagebrush canopy cover in priority habitat at no less than 15% unless required, would maintain vegetative cover and soil stability, health, and productivity. When compared to Alternative A these treatments would encompass a larger area.

Only allowing for vegetation treatments that conserve, enhance, or restore sage-grouse habitat in priority habitat, including restoration of burned areas, would ensure long-term persistence of native plants within priority sage-grouse habitats. Not using prescribed fire in less than 12-inch precipitation zones, and resting treated areas for two full growing seasons would result in increased long-term soil health and stability, when compared to Alternative A, because a larger area (entire priority habitat) would be required to follow this action. Fire in sage-grouse priority habitat would be suppressed to conserve habitat. Fewer acres of sagebrush habitat would be converted to an early seral stage than under Alternative A. However, there could also be a greater potential for catastrophic fire as a result of fire suppression and exclusion. As a result of habitat restrictions, more fires would be suppressed in the surrounding vegetative communities to protect sagebrush, and less habitat would be lost to fire. However, increased fire suppression could also contribute to larger catastrophic fires due to increases in fuel loading in areas outside of priority habitat. Changes in soil and water properties would be more likely to occur outside of priority habitat under this alternative. Requiring treatments in known sage-grouse winter range to maintain habitat quality would reduce the impacts from these treatments, compared to Alternative A, as the entire winter range within the planning area would be subject to this requirement.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a) would have the same impacts discussed under Alternative A. Identifying areas within sage-grouse priority habitat for vegetation restoration and implementing vegetation restoration would reestablish vegetation cover and stabilize the soil, and in the long-term rebuild pre-disturbance soil productivity levels.

Managing discrete anthropogenic disturbances within sage-grouse priority and connectivity habitat areas would increase protection to soils within these areas over the long-term. Density of disturbance on the landscape would not exceed 3% disturbance within the total sage-grouse habitat, and an average of 3% disturbance per 640 acres (within sage-grouse connectivity habitat areas). These limits would reduce the amount of surface disturbance in these areas, which would reduce vegetation removal and subsequent soil erosion and runoff, and help maintain overall health and function of vegetation communities and soil productivity over the long-term.

Not allowing new surface occupancy within sage-grouse priority habitat and connectivity habitat, including winter concentration areas, would result in impacts to watershed resources and water quality similar to Alternative A, except the prohibited area would increase. If a lease is within priority habitat, a 4-mile perimeter would apply, with a limit to one disturbance per section, with no more than 3% surface disturbance in that section. This increased area of restrictions would limit the amount of surface occupancy and subsequent vegetation removal, soil erosion, and runoff, relative to Alternative A.

Prohibiting surface disturbing activities during the nesting and early brood-rearing season within all sage-grouse nesting/early brood-rearing habitat inside priority habitat areas, and within sage-grouse winter concentration areas inside priority habitat areas, would increase protections to soils in the short-term, compared to Alternative A, as the prohibitions would expand to a larger area.

4.12.5 Alternative C

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per *BLM Handbook H-1740-2* and *Forest Service Manual 2080* would have the same impacts to soils as discussed under Alternative B.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as consolidation of infrastructure to reduce habitat fragmentation and loss and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, would have the same impacts to soils as under Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within sage-grouse priority habitat, would have the same impacts to soils as under Alternative A.

The impacts associated with utility corridor designations discussed in Alternative A would not be realized. Relocating corridors outside of priority habitat would result in impacts to soils similar to Alternative B.

Managing sage-grouse priority and general habitat areas as ROW exclusion areas for new ROW or SUA permits (Map 2-11) would decrease the impacts to soils within priority and general habitat, compared to Alternative A, because 11,270,560 more acres would be excluded from surface disturbance associated with ROW or SUA permits. However, these activities could occur outside these habitat areas, which would only displace the impacts to soils

Impacts from managing sage-grouse general habitat areas as ROW avoidance areas discussed in Alternative A would not be realized.

Wind energy development activities would be excluded within sage-grouse priority and general habitat areas (11,531,340 acres) (Map 2-31), which would be a greater prohibited area, relative to Alternative A. Approximately 127 2-MW wind turbines are projected to be constructed, which would be 90% fewer turbines than under Alternative A. These prohibitions would reduce the amount of vegetation removal, soil erosion and runoff, and loss of soil productivity associated with wind energy development activities, when compared to Alternative A.

Authorizing the construction of MET towers in certain areas, and on a case-by-case basis, could result in would have the same impacts to soils as under Alternative A.

Industrial solar projects result in short-term surface disturbance associated with solar field construction, panel placement, and transmission lines. Prohibiting industrial solar projects in ACECs and occupied sage-grouse habitats would result in increased protections to soils in these areas, because no surface disturbance, vegetation removal, and soil destabilization and erosion would occur. However, this action could result in a higher concentration or size of industrial solar projects outside these areas, which would result in increased surface disturbance, loss of vegetation, and increased soil erosion outside ACECs and occupied sage-grouse habitats.

Prohibiting livestock grazing within sage-grouse priority habitat and avoiding new structural range developments in sage-grouse priority and general habitat would increase protections to soils, compared to Alternative A, as no surface disturbing activities associated with livestock grazing would occur and range developments would be less likely to occur due to avoidance stipulations, and the area of these stipulations would be larger.

Ensuring that soil cover and native herbaceous plants are at their ESD within sage-grouse habitat would help to maintain vegetation health, soil stability, and productivity over the long term.

Impacts to soils from livestock grazing would be similar to Alternative A because riparian areas and wet meadows would be managed for PFC or other similar methodology (Forest Service only) within sage-grouse priority habitats, which would enhance the vegetation communities in these areas, and thereby enhance soil productivity and stability. Additionally, within sage-grouse priority and general habitats, wet meadows would be managed to maintain a component of perennial forbs with diverse species richness and productivity relative to site potential (e.g., reference state) and at least six inches of stubble height would remain on all riparian/meadow area herbaceous species at all times, which would further stabilize soil, preventing soil runoff and erosion, and maintaining productivity, compared to Alternative A. Not authorizing any new water developments for diversion from spring or seep sources within sage-grouse priority and general habitats would decrease impacts to soils, compared to Alternative A, as no new water developments and associated surface disturbance, vegetation removal, and soil erosion would occur within priority and general habitat. Modifying water developments within sage-grouse habitat, including dismantling of water developments would have the same impacts to soils discussed under Alternative B.

Exceptions to lease stipulations, COAs, and T&Cs for sage-grouse would not be considered within sage-grouse priority and general habitat. Vegetation loss and subsequent soil erosion in the planning area would decrease, relative to Alternative A, if potential additional surface disturbances resulting from these exceptions would not occur. If exceptions are to timing limitation stipulations, only the timing of the activity would change (not the surface disturbance), which would result in impacts to soils similar to Alternative A.

Closing priority and general sage-grouse habitat to fluid mineral leasing would result in 16,878,220 acres that would be closed, an increase of nearly 20 times the area closed under Alternative A. Vegetation removal, soil erosion, and loss of productivity would not occur in these areas, except for when there is an opportunity for the BLM and Forest Service to influence conservation measures, which may result in short-term surface disturbance. However, in the long term, it would enhance vegetation, soil productivity, and soil stability when compared to Alternative A (Map 2-6). Under this alternative, 9,533 BLM or Forest Service oil and gas wells and 1,594 CBNG wells would be anticipated in sage-grouse priority habitat and connectivity habitat areas, resulting in 85,140 acres that would be disturbed over the short-term (before reclamation), and 27,030 acres that would be disturbed over the long-term (after reclamation). The number of wells anticipated would be approximately 32% less than the amount of wells anticipated under Alternative A.

Not applying minimum lease sizes within sage-grouse priority habitat areas would have the same impacts to soils as discussed under Alternative A.

Not allowing any new geophysical exploration within sage-grouse priority and general habitat areas would decrease impacts to soils, when compared to Alternative A, in the long-term because no new geophysical exploration would be allowed within sage-grouse priority habitat areas. In the short-term, impacts to soils could be similar to Alternative A.

Applying conservation objectives throughout the planning area would further reduce soil impacts associated with oil and gas activity, compared to Alternative A, because the objectives would be more intensive, and

COAs, minimization of impacts to priority habitat through project design, and mitigation requirements would be applied.

Not allowing new surface occupancy on existing federal fluid mineral leases and requiring unitization when necessary for proper development and operation of an area within sage-grouse priority habitats would have the same impacts to soils as discussed under Alternative B.

Requiring a full reclamation bond specific to the site in accordance with 43 CFR 3104.2, 3104.3, and 3104.5 would result in impacts to soils similar to Alternative A.

Finding all surface coal mining unsuitable and not allowing new leases for other non-energy leasable minerals within sage-grouse priority habitat (Map 2-26) would prohibit surface disturbing activities associated with these activities throughout the habitat, as opposed to smaller, specific areas outlined in Alternative A, so impacts to soils would be reduced, compared to Alternative A. Additionally, granting no new underground coal mining leases unless all surface disturbances (appurtenant facilities) are placed outside of the sage-grouse priority habitat area would decrease the impacts to soils within priority habitat, compared to Alternative A, as no surface disturbing activities could occur. However, this could increase the amount of short-term surface disturbance outside priority habitat areas, compared to Alternative. Additionally, if new facilities associated with existing leases cannot be located outside the sage-grouse priority habitat area, co-locating new facilities or building them to the absolute minimum standard necessary would decrease impacts to soils, compared to Alternative A, as the surface disturbing activities would be more concentrated, resulting in less vegetation removal, soil compaction, and soil erosion.

Proposing withdrawal from locatable mineral entry based on risk to the sage-grouse and its habitat from conflicting locatable mineral potential and development (Map 2-21) would result in the same impacts discussed in Alternative B.

Mineral material exploration, sales, and free use permits would be closed in sage-grouse priority habitat areas, subject to valid existing rights (Map 2-16). A reduction in these operations would reduce the amount of associated surface disturbance, and subsequently reduce soil erosion and runoff, compared to Alternative A.

Restoring salable mineral pits no longer in use would decrease impacts to soils compared to Alternative A, because localized vegetation would be established, and soil stability and productivity would increase in the short and long-term.

Allowing BLM SRPs and Forest Service RSUAs in priority habitat that have neutral or beneficial effects to priority habitat areas would decrease the extent of impacts to soils, compared to Alternative A, in priority habitat, as maintaining soil health and stability would be a neutral or beneficial effect.

Managing the OHV use in the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area as “open,” in addition to all other OHV “open” areas within sage-grouse priority habitat areas, as “limited to designated roads and trails,” would result in greater protections to soils, compared to Alternative A, if recreational riders avoided these areas, as vegetation would return, soil stability would improve, and soil erosion would decrease.

Limiting route construction to realignments of existing designated routes within priority and general habitat, not allowing upgrading of existing routes that would change route category or capacity unless necessary, and mitigating any impacts with demonstrated methods to offset the loss of sage-grouse habitat would have impacts to soils similar to Alternative B, but to a lesser extent as these requirements would apply to both priority and general sage-grouse habitat. Restoration of roads, primitive roads, and trails not designated in

travel management plans within priority habitat would result in similar impacts to Alternative A, but to a larger extent as all priority habitat would be subject to this action.

Maintaining sagebrush canopy cover in priority and general habitat at no less than 15% unless strategically required for habitat protection and conservation would maintain vegetative cover, which would maintain soil stability, health, and productivity, when compared to Alternative A. These treatments would encompass a larger area than in Alternative A.

Only allowing for vegetation treatments that conserve, enhance, or restore sage-grouse habitat in priority and general habitat would have similar effects to soils as Alternative B, except the extent would be greater, as the area would be larger. Requiring fuels treatments in known sage-grouse winter range to maintain habitat quality would reduce the impacts from these treatments, compared to Alternative A, as the entire winter range within the planning area would be subject to this requirement. And, avoiding sagebrush reduction/treatments in sage-grouse priority and habitat areas, and including plans to restore high-quality habitat in areas with invasive species would maintain the vegetative community, soil stability, and soil productivity.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a) would have the same impacts discussed under Alternative A. Rehabilitating and restoring vegetation within sage-grouse priority and general habitat would enhance soil conditions, compared to Alternative B, because a larger area would be restored.

Not using fire to treat sagebrush in less than 12-inch precipitation zones, unless as a last resort, would result in less impacts to soils compared to Alternative A, because a larger area (priority and general sage-grouse habitat) would be restricted from use of prescribed fire. If fire is used as a last resort, impacts to soils would be similar to those discussed under Alternative A.

Ensuring long-term persistence of native plants, including sagebrush, within sage-grouse priority and general habitat, would have similar effects to soils as those discussed under Alternative B, but to a greater extent, as it would include a larger area within the planning area.

Excluding livestock grazing from burned areas until woody and herbaceous plants achieve sage-grouse habitat objectives, and closing sage-grouse priority and general habitat to grazing until recovered, would protect soils within sage-grouse priority and general habitat by allowing vegetation communities to become established, and soil stability to be maintained.

Not allowing new surface occupancy within sage-grouse priority habitat and connectivity habitat, including winter concentration areas, would result in impacts to soil resources similar to Alternative A, except the prohibited area would increase. If a lease is within priority habitat, a 4-mile perimeter would apply, with a limit to one disturbance per section, with no more than 3% surface disturbance in that section. This increased area of restrictions would limit the amount of surface occupancy and subsequent vegetation removal, soil erosion, and runoff, relative to Alternative A.

Prohibiting surface disturbing and disruptive activities during the nesting and early brood-rearing season within all sage-grouse nesting/early brood-rearing habitat inside and outside priority and general habitat areas and connectivity habitat, and within sage-grouse winter concentration areas inside priority habitat areas, would reduce vegetation removal, erosion, and runoff, compared to Alternative A, in the short-term when seasonal prohibitions are in effect.

4.12.6 Alternative D

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per the *BLM Handbook H-1740-2* and *Forest Service Manual 2080* would have the same impacts to soils as under Alternative B.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as consolidation of infrastructure to reduce habitat fragmentation and loss, and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, would have the same impacts to soils as under Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within sage-grouse core and connectivity habitat would have the same impacts to soils as under Alternative A.

Managing sage-grouse core and connectivity habitat areas as ROW exclusion areas for new ROW or SUA permits, and limiting ROWs and transmission projects in existing utility corridors within a designated two-mile wide corridor through sage-grouse core and connectivity habitat areas or within 0.5 miles on either side of existing 115 kV or larger transmission lines, between July 1 and March 14 (or between July 1 and November 30 in winter concentration areas) would result in a greater area open for surface disturbances associated with these projects (Map 2-12). Impacts to soils would decrease, compared to Alternative A, because 4,944,180 acres more would be excluded from surface disturbance and subsequent vegetation removal, soil erosion, and runoff associated with ROW or SUA permits.

Alternatively, allowing general sage-grouse habitat areas to be available for new ROWs or SUAs, subject to BMPs, would result in increased impacts to soils, compared to Alternative A, because these areas would be available for ROW utility placement, which would result in surface disturbance, vegetation removal, soil compaction, erosion, and destabilization.

Excluding wind energy development on 424,820 acres and avoiding wind energy development within the remaining portions of sage-grouse core and connectivity habitat, unless it can be sufficiently demonstrated that the development activity would not result in declines of sage-grouse core and connectivity habitat populations, would result in the anticipated construction of up to 980 2-MW wind turbines through 2020 (22% fewer turbines than under Alternative A).

Authorizing the construction of MET towers in certain areas, and on a case-by-case basis, would have the same impacts to soils as under Alternative A.

Utilization of BLM and Forest Service guidance to evaluate land health standards achievement in sage-grouse core and connectivity habitat would have the same impacts discussed under Alternative A. Continuing to evaluate and modify when necessary, existing range improvements associated with grazing management operations for reducing impacts on sage-grouse and its habitat within sage-grouse general and core and connectivity habitat, would result in reduced impacts to soils, compared to Alternative A, as these range improvement activities would be evaluated and modified to minimize surface disturbing activities.

Balancing grazing in sage-grouse core and connectivity habitat between riparian habitats and upland habitats would further decrease impacts to soils, compared to Alternative A, because riparian and upland vegetation communities would be maintained in a larger area of the planning area. This would decrease the surface disturbance associated with livestock grazing, and thereby maintain a larger area of upland and riparian vegetation communities, soil stability, and productivity. Within sage-grouse core and connectivity habitat, authorizing water developments as needed to support grazing objectives within sage-grouse core

and connectivity habitat would decrease the extent of impacts to soils, compared to Alternative A, as there would likely be fewer water developments.

Continuing exceptions to lease stipulations, COAs, and terms and conditions for sage-grouse within sage-grouse core, connectivity, and general habitat on a case-by-case basis would have the same impacts to soils as under Alternative A.

Allowing fluid mineral leasing would have impacts to soils similar to those discussed in Alternative A. Under this Alternative, 964,860 acres would be closed and 2,117,990 acres would be managed with CSU stipulations (Map 2-7). Approximately13,083 BLM or Forest Service oil and gas wells and 2,686 CBNG wells would be anticipated in sage-grouse core habitat and connectivity habitat areas, 4% less than in Alternative A, resulting in 122,910 acres that would be disturbed over the short-term (before reclamation), and 37,720 acres that would be disturbed over the long term (after reclamation).

Not applying minimum lease sizes within sage-grouse core and connectivity habitat areas would have the same impacts to soils as discussed under Alternative A.

Impacts to soils from geophysical surveys would be the same as those discussed under Alternative A.

Working with proponents during oil and gas leasing to promote measurable sage-grouse conservation objectives could reduce the impacts to soils, if conservation objectives would include minimization of vegetation removal, stabilization of soil, and control of soil runoff, compared to Alternative A.

Actions to minimize impacts to sensitive resources, including vegetation, and requiring reclamation bonds before any drillings or surface disturbing activities occur would result in the same impacts to soils discussed under Alternative A.

Using unitization for orderly development of an area within sage-grouse core and connectivity habitat would have the same impacts to soils discussed under Alternative B.

Surface mining could occur in sage-grouse core and connectivity habitat areas, but would have impacts similar to Alternative A, but the extent of impacts would be less. Underground coal mining and allowing for coal exploration activities within sage-grouse core and connectivity habitat areas (Map 2-27) would also have the same impacts to soils as discussed under Alternative A.

Consideration of all non-energy leasable mineral activities in sage-grouse core and connectivity habitat would result in similar impacts to soils if these activities were allowed. If they were not allowed, impacts to soils would be reduced, when compared to Alternative A.

Withdrawing core and connectivity habitat areas from locatable mineral entry (Map 2-22), opening sage-grouse core and connectivity habitat areas to mineral material exploration, sales, and free use permits (Map 2-17), and continuing to have salable mineral pits not in use available for other uses would all result in the same impacts to soils as discussed under Alternative A.

Approving BLM SRPs and Forest Service RSUAs in sage-grouse priority habitat on a case by case basis would have impacts to soils similar to Alternative A, except the area would be larger. If not approved, impacts to soils would be the same as discussed under Alternative A.

Managing the Poison Spider OHV Park, part of the hill climb area in Section 33, T15 North, R114 West, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area as OHV “open” areas would have the same impacts to soils discussed under Alternative A.

Allowing road upgrades within sage-grouse core, connectivity, and general habitat could result in short-term impacts to soils similar to Alternative A. Allowing natural deterioration of roads within sage-grouse core, connectivity, and general habitat would decrease impacts to soil, compared to Alternative A, but in the short-term the effects would not be as great as Alternative A, due to the lack of active restoration. In the long-term, effects would be greater than Alternative A because the area is larger. However, if vegetation could not be established, effects would be less than Alternative A.

Managing for vegetation composition and structure that reflects desired plant community or comparable standard within sage-grouse core and connectivity habitat would increase the overall health and function of vegetation communities and minimize soil erosion, compared to Alternative A, because a larger area of the planning area would be managed.

Using the *WGFD Protocols for Treating Sagebrush to Benefit Sage-Grouse* for vegetation treatments in core and connectivity habitat areas would result in impacts to soils similar to those discussed under Alternative B, except the effects would be more intense as treatment proposals would be subject to these additional protocols.

Treated areas that are not rested from livestock grazing could result in increased impacts to soils, when compared to Alternative A, because grazing could lead to surface disturbance, soil compaction, and vegetation loss, which would lead to an increase in soil erosion and decrease in soil productivity.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a), rehabilitation and restoration measures that occur after wildland fire, and use of prescribed fire would all have the same impacts discussed under Alternative A.

Managing the density of energy production (excluding coal and trona mining) and/or transmission structures (excluding buried pipelines or power lines) on the landscape inside sage-grouse core and connectivity habitat areas would increase impacts to soils within the planning area long-term, compared to Alternative B. A limit of three energy production locations and/or transmission structures per 640 acres within the DDCT would now be allowed, regardless of the percent disturbance in Alternative B, and a greater limit of sagebrush habitat loss (9%) would be allowed under this alternative, when compared to the limit of 3% surface disturbance (and subsequent sagebrush loss) in Alternative B.

Restricting surface occupancy and disturbance, including new road construction, around sage-grouse leks inside and outside sage-grouse core habitat areas would result in impacts to soils similar to Alternative A, except the area restricted would decrease. Surface disturbing activity and surface occupancy would be restricted within 0.25 miles of occupied sage-grouse leks across the planning area. Surface disturbing activities from newly permitted activities would be restricted within 75,870 acres (Map 2-2), compared to Alternative A, in which surface disturbance would be prohibited on 68,550 acres, and restricted on 93,580 acres. These actions would allow for a greater area of surface disturbance and subsequent vegetation removal, soil erosion, and runoff.

Seasonal restrictions of surface disturbing and/or disruptive activities within sage-grouse nesting and early brood-rearing habitat inside and outside sage-grouse core habitat and connectivity habitat areas during the sage-grouse nesting season, and seasonal prohibitions within sage-grouse winter concentration areas and areas supporting connectivity populations inside sage-grouse core habitat areas reduce vegetation removal, erosion, and runoff, compared to Alternative A, as timing and area of these restrictions and prohibitions would be expanded.

4.12.7 Proposed Land Use Plan Amendments

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per *BLM Handbook H-1740-2* and *Forest Service Manual 2080* would have the same impacts to soils as under Alternative B.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as consolidation of infrastructure to reduce habitat fragmentation and loss, and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, would have the same impacts to soils as under Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within PHMAs would have the same impacts to soils as under Alternative A.

Allowing ROWs and transmission projects in existing utility corridors within a designated two-mile wide corridor through PHMAs, or within 0.5 miles on either side of existing 115 kV or larger transmission lines, would result in the same impacts to soils as discussed under Alternative A, but the intensity would be less, as new transmission projects in existing utility corridors would be subject to more surface disturbance stipulations and review designed to protect sage-grouse populations in PHMAs. These would include the use of the *Framework for Sage-Grouse Impacts Analysis for Interstate Transmission Lines* or other appropriate documents, and prohibiting surface disturbing and/or disruptive activities from March 15 to June 30. New ROW or SUAs could be issued in existing designated ROW corridors with appropriate sage-grouse seasonal timing constraints, which could reduce impacts to soils, but not to the extent as in Alternative B because surface disturbance associated with ROWs and SUAs would likely still occur.

Managing PHMAs as ROW avoidance areas for new ROW or SUA permits (Map 2-13) would result in similar impacts to soils as discussed under Alternative A, except there would be more avoidance areas, which could increase the extent of impacts to soils.

Co-locating new ROWs/SUAs, where feasible, would result in decreased impacts to soils, compared to Alternative A, because surface disturbance associated with new ROWs/SUAs would be in a concentrated area, which would minimize the amount of vegetation removal, soil compaction, erosion, and destabilization associated with these activities. Timing restraints would have no effect because the surface disturbance could still occur at other times of the year.

Excluding wind energy development on 425,080 acres and avoiding wind energy development within the remaining portions of PHMAs, unless it can be sufficiently demonstrated that the development activity would not result in declines of PHMA populations, would result in the anticipated construction of up to 127 2-MW wind turbines through 2020 (90% fewer turbines than under Alternative A).

Impacts to soils from MET tower construction would be reduced, compared to Alternative A, because the siting perimeter avoidance area is larger compared to Alternative A.

Utilization of BLM and Forest Service guidance to evaluate land health standards progress towards or achievement in PHMAs would have the same impacts discussed under Alternative A. Continuing to evaluate, and modify when necessary, existing range improvements for impacts on sage-grouse and its habitat within PHMAs and GHMAs would result in reduced impacts to soils, compared to Alternative A, as these range improvement activities would be evaluated and modified to minimize surface disturbing activities. Continuing to authorize mineral, salt, and nutritional supplements and supplemental feeding for livestock where appropriate would result in impacts to soils as discussed under Alternative A.

Balancing grazing in PHMAs between riparian habitats and upland habitats would further decrease impacts to soils, compared to Alternative A, because riparian and upland vegetation communities would be maintained in a larger area of the planning area. This would decrease the surface disturbance associated with range improvements, maintain a larger area of upland and riparian vegetation communities and, in turn, maintain soil stability and productivity. Evaluating and modifying water developments that have a negative effect on PHMAs would have the same impacts to soils discussed under Alternative B.

Continuing exceptions to lease stipulations, COAs, and terms and conditions for sage-grouse within PHMAs and GHMAs on a case-by-case basis would have the same impacts to soils as under Alternative A.

Impacts to soils from fluid mineral leasing in PHMAs would be similar to Alternative A, except to a lesser extent, as more acres would be managed with NSO and CSU stipulations (441,690 and 6,438,480 acres, respectively; Map 2-8). As a result, 12,355 BLM or Forest Service oil and gas wells and 2,462 CBNG wells would be anticipated in available PHMAs, 10% less than Alternative A. Over the short term (before reclamation), 112,330 acres would be disturbed, and 35,430 acres would be disturbed over the long term (after reclamation). The agencies would allow oil and gas leasing consistent and subject to the leasing stipulations analyzed in the timing, distance, disturbance, and density restrictions sections (Appendix D).

Application of a minimum lease size of 640 acres within PHMAs on BLM-administered lands would help to prevent fragmentation and increased numbers of smaller-sized leases by reducing the potential for increased surface disturbance and subsequent soil erosion and loss, as well as a loss of soil productivity, relative to Alternative A. There are exceptions for leases smaller than 640 acres, such as for regulatory compliance, but these exceptions would likely not be numerous enough to outweigh the reduction in soil erosion and loss from minimum lease sizes.

Allowing geophysical exploration projects within PHMAs, except where prohibited or restricted by existing LUP decisions, would reduce the extent of impacts to soils, compared to Alternative A, because the projects would be designed to minimize habitat fragmentation within PHMAs, which would reduce the amount of surface disturbance, vegetation removal, and soil erosion associated with these projects.

Working with project proponents to site their projects in locations that minimize impacts to sensitive resources would result in impacts to soils similar to Alternative A.

Requiring any development within PHMAs to be placed in the area least harmful to sage-grouse based on vegetation, topography, or other habitat features would have impacts to soils similar to Alternative A, but to a greater extent within PHMAs.

Encouraging unitization within PHMAs would have the same impacts to soils discussed under Alternative B where it is utilized. Areas within PHMAs where unitization is not utilized could have increased impacts to soils, compared to Alternative B, as more areas may be developed and undergo surface disturbance, vegetation removal, and subsequent soil erosion and loss of productivity.

Requiring reclamation bonds or partial reclamation bonds commensurate with the scope, scale, size of the project within PHMAs would result in impacts to soils similar to Alternative A.

Under the Proposed LUP Amendments, surface mining and underground coal mining could occur in PHMAs (Map 2-28). Surface disturbance, where it did occur, would have impacts similar to Alternative A, but the extent of impacts would be less. Allowing coal exploration activities in PHMAs would result in impacts to soils similar to Alternative A, as these activities could occur within PHMAs, but the extent would be less due to surface occupancy, and disturbance and density stipulations, which may reduce vegetation

removal and subsequent soil erosion and topsoil loss, if the analyses and potential mitigation measures result in revegetation and soil stabilization.

Consideration of all non-energy leasable mineral activities in PHMAs would result in impacts to soils similar to Alternative A, if these activities were allowed. If these activities were not allowed, impacts to soils would be reduced, compared to Alternative A, as no surface disturbance and subsequent vegetation removal, soil erosion, and loss of productivity would occur.

Impacts to soils from withdrawal of portions of PHMAs from locatable mineral entry on BLM-administered lands would be similar to those identified under Alternative A, except areas proposed for withdrawal and considered for proposed withdrawal would increase to 1,146,130 acres (Map 2-23). This would decrease surface disturbances, vegetation removal, and soil erosion associated with locatable mineral development activities.

Impacts to soils from mineral material exploration, sales, and free use permit operations (Map 2-18) would be similar to Alternative A, except in PHMAs where restrictions to surface disturbance and disruptive activity may result in less surface disturbance and subsequent vegetation removal, soil erosion, and runoff inside these areas. However, these operations may be sited outside of PHMAs, in which case the impacts to soils would be the same as Alternative A.

Considering closure and restoration of salable mineral pits no longer in use would result in similar impacts to soils as those discussed under Alternative A if the mineral pit is not restored, and would decrease impacts to soils when compared to Alternative A, if restored. Localized vegetation would be established and soil stability and productivity would increase in the short and long-term.

Allowing BLM SRPs and Forest Service RSUAs in PHMAs unless negative impacts to sage-grouse cannot be adequately mitigated would have impacts to soils similar to Alternative A, except in cases where BLM SRPs and Forest Service RSUAs are approved, in which case impacts to soil would increase in the short-term, until those impacts were mitigated.

Designating all OHV "open" areas within PHMAs as limited to existing roads and trails, and allowing the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area, and continuing to manage the sand dune portions of these areas where roads do not exist as "open," would result in greater protections to soils, compared to Alternative A, if recreational riders avoided these areas, as vegetation would return, soil stability would improve, and soil erosion would decrease.

Using existing roads and not allowing upgrading of existing routes unless there would be minimal impact to PHMAs would result in impacts to soils similar to Alternative B, except the area of surface disturbance could be larger, because of the 5% limit, versus the 3% limit in Alternative B. If the disturbance is less than 5%, but greater than 3%, mitigation would not be necessary, which would result in loss of vegetation, and subsequent soil erosion in the short-term, until mitigation efforts result in revegetation and soil stabilization. Allowing natural reclamation of roads and trails within PHMAs would have impacts to soils similar to Alternative A, except this action would also include those not designated in WSAs and within lands with wilderness characteristics that have been selected to be managed to retain those characteristics for protection.

Managing for vegetation composition and structure that reflects ESD within PHMAs and GHMAs, and deferring grazing on treated areas for two full growing seasons, would increase the overall health and function of vegetation communities, compared to Alternative A, because a larger area of the planning area would be managed. Not conducting vegetation treatments in nesting and wintering PHMAs (core only) that

would reduce sagebrush canopy to less than 15%, unless beneficial to sage-grouse habitat, would decrease impacts to soil, compared to Alternative A, because these treatments would encompass a larger area than in Alternative A.

Using the *WGFD Protocols for Treating Sagebrush to Benefit Sage-Grouse* for vegetation treatments in PHMAs would result in similar impacts to Alternative B, except the effects would be more intense as treatment proposals would be subject to these additional protocols.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a), along with development of a monitoring plan for each reclamation project, would have the same impacts discussed under Alternative A.

Restoration of burned areas within PHMAs would further enhance soil conditions, compared to Alternative A, because the restoration would occur within PHMAs throughout the entire planning area.

Avoiding the use of prescribed fire in areas of Wyoming big sagebrush, other xeric sagebrush species, where cheatgrass or other fire-invasive species occur, and/or within areas of less than 12-inch precipitation zones, and complying with *WGFD Protocols for Treating Sagebrush to Benefit Sage-Grouse* and Appendix A to avoid being considered a PHMA disturbance, would have impacts similar to Alternative A, but not as extensive, as these requirements would likely result in less prescribed fire use within PHMAs. The Proposed LUP Amendments would also prioritize suppression in PHMAs, but suppression activities would also take into account all resource values managed by the BLM/Forest Service. Changes in soil and water properties would be more likely to occur under this alternative outside of PHMAs, than under the other action alternatives.

Ensuring long-term persistence of native plants, including sagebrush within PHMAs, would have similar effects to soils as those discussed under Alternative B, but to a greater extent, as it would include a larger area within the planning area, and erosion would be controlled.

Impacts to soils from managing the density of surface disturbing activities to not exceed an average of one oil and gas or mining activity location per 640 acres (within PHMAs (core only)) and 5% loss of sagebrush habitat within PHMAs would have impacts similar to Alternative B, but to a slightly greater extent as surface disturbance could occur within 5% of PHMAs (core only), compared to 3% in Alternative B.

Prohibiting surface occupancy and disturbance activity prohibitions around sage-grouse leks inside and outside PHMAs (core only) would increase protections to soils, compared to Alternative A. Surface disturbing activities and occupancy would be prohibited within 0.6 miles of occupied sage-grouse leks inside PHMAs and within 0.25 miles of occupied sage-grouse leks outside of PHMAs (Map 2-3). Under this alternative, surface occupancy or surface disturbance would be prohibited on 337,860 acres, and would be restricted on 160,630 acres. Primary and secondary (BLM route category) or Route Category level 4 and 5 (Forest Service) road construction within 1.9 miles of the perimeter of occupied sage-grouse leks would also be avoided. This increased area of prohibitions around the sage-grouse leks would decrease the amount of surface occupancy and disturbance to soils in these areas and resulting soil erosion and loss of productivity, relative to Alternative A, in which surface disturbance would be prohibited on 68,550 acres and restricted on 93,580 acres. The exception would be the Bates Hole and Fish Creek/Willow Creek areas within the Casper Field Office and the MBNF, where the four-mile surface and two-mile disturbance buffer around occupied sage-grouse leks (respectively) would be reduced to a 0.6-mile prohibition. Also, the restrictions on new primary and secondary or Route Category level 4 and 5 road construction may result in increased road construction outside of the prohibited areas, as longer roads may be constructed to circumvent the lek buffers, which could cause increased surface disturbance and subsequent soil erosion and loss of productivity in these areas, relative to Alternative A.

Seasonal prohibitions of surface disturbing and/or disruptive activities within sage-grouse nesting/early brood-rearing habitat inside and outside PHMAs, along with winter concentration areas, would increase protections to soils, compared to Alternative A, as surface disturbance would be entirely eliminated in these areas for a longer time period.

4.13 SPECIAL DESIGNATIONS AND MANAGEMENT AREAS

This section identifies potential impacts to special designations and management areas (SD/MA) from implementing actions presented in Chapter 2. Existing conditions of SD/MAs are described in Chapter 3.

The SD/MAs discussed in this section include ACECs and other Management Areas (MA) within the BLM field offices; SIAs, Research Natural Areas (RNA), and Inventoried Roadless Areas (IRA) within the Forest Service planning units; and Wilderness Areas, WSAs, National Historic Trails (NHT), and Wild and Scenic Rivers (WSR) within the planning area.

4.13.1 Impact Indicators

Indicators of impacts on special designations are as follows:

- The number and acreage of SD/MAs
- The amount of surface disturbing and disruptive activities occurring within or near SD/MAs
- The ambient noise level within SD/MAs.

4.13.2 Assumptions

The analysis is based on the following assumptions:

- Existing management prescriptions would provide the necessary protections for which the SD/MAs were designated.
- Updated policy addressing the management of eligible, suitable, and designated WSRs was issued in 2012. The BLM will manage eligible, suitable, and designated rivers in accordance with BLM Manual 6400. This policy will be adhered to during any site-specific project NEPA analyses that are conducted in the planning area.
- New policy addressing the management of NHTs was issued by the BLM in 2012. The BLM will manage National Scenic and Historic Trail resources, qualities, values, and associated settings, and the primary use or uses in accordance with the direction provided in BLM Manual 6280. This policy will be adhered to during any site-specific project NEPA analyses that are conducted in the planning area.
- Updated policy addressing the management of WSAs was issued in 2012. The BLM will manage WSAs in accordance with BLM Manual 6330. This policy will be adhered to during any site-specific project NEPA analyses that are conducted in the planning area.
- Updated policy addressing the management of lands with wilderness characteristics was issued in 2012. The BLM will inventory and consider lands with wilderness characteristics in accordance with BLM Manual 6310 and 6320. This policy will be adhered to during any site-specific project NEPA analyses that are conducted in the planning area.
- The analysis of effects on ACECs from the implementation of management actions is limited to the protection of and prevention of damage to the relevant and important values.

- The analysis of effects on WSRs from the implementation of management actions is limited to the protection of and prevention of damage to outstandingly remarkable values.
- The analysis of effects on MAs, NHTs, SIAs, and RNAs from the implementation of management actions is limited to the protection of and prevention of damage to the resources or resource uses for which special management was applied.
- The analysis of effects on WSAs and IRAs from the implementation of management actions is limited to the reduction in parcel size, roadless characteristics, and naturalness for which those areas are designated.
- The WSAs in the planning area would continue to be managed under BLM Manual 6330 until such time as Congress either designates all or portions of the WSAs as wilderness or releases them from any further consideration for wilderness, and the lands revert back to general land use management.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

BLM Manual 6330 and FSM 2300 Chapter 2320 prescribe non-impairment as the standard for wilderness management. As stated in BLM Manual 6330, the Bureau's policy for the management of WSAs is to "…protect WSAs to preserve wilderness characteristics so as not to impair the suitability of such areas for designation by Congress as wilderness." While this policy does allow for some activities, such as recognizing valid existing rights and temporary uses that would not create surface disturbance, it is believed that impacts that could impair the WSA's wilderness characteristics would not occur. If any WSAs were released from wilderness consideration they would be managed as multiple use areas and the impacts identified below could occur within these areas.

4.13.3 Alternative A

Surface disturbing activities and disruptive activities occurring within SD/MAs would increase the potential for impacts on many of the resources or resource uses for which SD/MAs are managed. Examples of these activities include increased human presence, use of heavy equipment, development, and facilities associated with development such as compressors, power lines, pipelines, and generators. While management prescriptions currently exist that are intended to provide protection to the resources and resource uses in SD/MAs, in some instances surface disturbing activities could potentially cause impacts to these values that were not anticipated. Such impacts include but are not limited to the discovery of and potential damage to previously unidentified historic or cultural sites, increased potential of natural hazards, disturbance and degradation of vegetation communities and soil composition, and the degradation of scenic, historic, wild, recreational, and undisturbed natural resources. These impacts would likely be short-term in duration because mitigation measures would be applied that would assist in the management of the resource values or resources uses associated with the SD/MAs.

Prohibiting surface disturbing activities on 68,550 acres and restricting surface disturbance on 437,680 acres (Map 2-1) would reduce the overall level of surface disturbance within SD/MAs from new permitted activities. This would affect SD/MAs by implementing additional management prescriptions that would indirectly provide protection to the resources and resource uses for which the SD/MAs are managed. Restricting or avoiding surface disturbance would provide additional protections to SD/MAs that are managed to protect wildlife by preserving the natural habitat and precluding actions and permanent facilities that may prevent wildlife movement and migration. The potential for degrading or destroying undiscovered cultural or paleontological resources and historic places would be reduced from prohibiting or avoiding surface disturbing activities. Avoidance would reduce the potential for disturbance and degradation of

vegetation communities, soils, and wild, recreational, and scenic resources. The SD/MAs that seek to manage for primitive and semi-primitive recreation opportunities would be impacted by reducing the potential for development and facilities that would degrade the setting and reduce the quality and experience of the visitor. The SD/MAs that are managed for primitive and semi-primitive recreation opportunities would be impacted by reducing the potential for development and facilities that would degrade the setting and reduce the quality and experience of the visitor.

Seasonal timing limitations on occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas and seasonal restrictions on disruptive activities would reduce the level of development in these areas during this time periods listed in Chapter 2. This would reduce the extent of disturbed areas and the potential for impacts to the resources and resource uses for which SD/MAs are managed. However, any exception to seasonal restrictions could potentially result in indirect impacts to the resources and resource uses of the SD/MAs by allowing surface disturbing and disruptive activities to proceed.

ROW exclusion (285,930 acres) and avoidance areas (2,460,340 acres) (Map 2-9) within core and general habitat and limiting ROWs and transmission projects to designated corridors in some areas would serve to consolidate utility ROWs and structures. This would reduce the overall potential of surface disturbance in these areas and the associated impacts to SD/MAs resources and resource uses. However, if no alternative location is available and utility structures were placed within sage-grouse core habitat, potential impacts to SD/MAs resource and resource uses could occur. The likelihood of such impacts would be minimal because of site specific environmental analysis for each proposed ROW and mitigation measures that would be applied to prevent or limit impacts to SD/MAs resources or resource use. Impacts from the development of any ROW granted would be short-term in duration and would primarily occur from surface disturbance during the construction phase and any associated maintenance. In some instances, such as the development of power lines, impacts to wildlife could occur from increased potential for predator presence from the power lines being used as perching sites. This would reduce management values in SD/MAs that have wildlife as a value. The SD/MAs that have scenic values would be affected by above and below ground ROW infrastructure projects. Such impacts could be reduced and localized through measures to consolidate ROW corridors and through exclusion and avoidance.

Pursuing land acquisitions would increase the acreage of federal lands. New land acquisitions could be added for the purpose of protecting natural resources and may ultimately be designated as special management areas with relevant, important, outstandingly remarkable, or other values worth protecting.

Oil and gas leasing would be allowed in portions of core and general sage-grouse habitat (Map 2-4) with 13,653 oil and gas wells and 2,758 CBNG wells projected during the planning period. This would cause an estimated 130,330 acres of short-term surface disturbance and 39,050 acres of long-term disturbance. This would increase the potential for impacts to special area values and resource uses within SD/MAs that allow for mineral development. Activities associated with oil and gas exploration and development would increase human presence and the use the heavy equipment in sage-grouse core habitat areas from surface disturbing activities. The increased development of oil and gas structures and the presence of associated infrastructures (e.g., power lines, compressors, pipelines, and fuel tanks) could potentially result in impacts to SD/MA values, such as undiscovered cultural or paleontological resources, historic places, wildlife habitat, and the increased potential for disturbance and degradation of vegetation communities, sensitive soils, recreational values, and visual resources.

Exceptions to lease stipulations, COAs, and T&Cs in regards to the NSO or CSU restrictions considered on a case-by-case basis would result in increased surface disturbing activities and human presence, which would have the potential for degradation of those resource values and some resource uses for which SD/MAs are managed. However, most impacts from exceptions may only change the timing of when

impacts occur because most lease exceptions only modify the timing limitation stipulations. Examples of impacts to SD/MAs include increased potential for impacts to undiscovered cultural or paleontological resources and historic places, wildlife habitat degradation, and the increased potential for disturbance and degradation of vegetation communities, sensitive soils, wild lands, recreational values, and visual resources. Most of the impacts would likely be short-term due to the management action to provide protections to the resources and resource uses of the SD/MAs. Additionally, reclamation efforts of surface disturbing activities in sage-grouse habitats and efforts to work with proponents to identify appropriate site locations would minimize impacts to sensitive resources and provide additional protections to SD/MAs resource values and uses.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would help to maintain the management of many of the SD/MAs resource values and uses by improving the overall health and function of vegetation communities in previously disturbed areas. This would also indirectly assist in providing protections to wildlife habit, maintaining soil stability, and preserving visual and natural qualities by promoting healthy, diverse vegetation communities.

Minimizing noise levels by applying BMPs to noise generating activities, such as oil and gas development and production, and other noise reducing stipulations would impact SD/MAs that are managed for wildlife and primitive to semi-primitive recreation opportunities. Restricting noise levels caused by development and facilities would assist in maintaining the primitive and semi-primitive recreational experiences for the recreational user by assisting management in maintaining the natural character of the area. Additionally, noise restrictions would provide additional protections to wildlife by reducing stress and providing opportunities for wildlife to maintain natural behaviors and behavior patterns.

Allowing wind energy development in sage-grouse core and general habitat areas, except in areas that are currently unavailable for such development (Map 2-29) would increase the potential for impacts to resource values and resource uses within SD/MAs that allow for such activities. Through the year 2020, an estimated 1,254 wind turbines will be constructed in the planning area. Because wind energy development is not anticipated to occur within ACECs, effects to the relevant and important values associated with these areas would not likely occur. The potential for wind energy development in SD/MAs would be minimal because of the existing objectives for which the areas are managed. However, if such activities were to occur, impacts would be similar to those associated with surface disturbing activities and development of energy-related facilities discussed above. Examples include increased potential for impacts to undiscovered cultural or paleontological resources and historic places, stress to wildlife and loss or degradation of habitat and migration patterns, and the increased potential for disturbance and degradation of vegetation communities, sensitive soils, wild lands, recreational values, and visual resources. Because of the height of wind turbines, development of wind energy on lands adjacent to SD/MAs would also create an impact in special areas where visual resources are an important value, such as areas protected for primitive and semi-primitive recreation opportunities.

Determining core habitat areas to be unsuitable for coal leasing, closing these areas to non-energy mineral leasing (Map 2-24), withdrawing the lands from locatable mineral entry (Map 2-19), and closing lands to mineral material exploration, sales and free use permits (Map 2-14) would result in decreased development in SD/MAs that allow for such activities. This would result in decreased surface disturbance and impacts to those resource values and uses that would otherwise be impacted by such activities. Examples include decreased potential for impacts to undiscovered cultural or paleontological resources, stress to wildlife and loss or degradation of habitat and migration patterns, and the decreased potential for disturbance and degradation of vegetation communities, soils, and visual resources. Impacts these types of mineral development would likely be minimal due to management prescriptions that are in place to protect those resource and resource uses and from reclamation efforts and site location efforts that are intended to minimize impacts to sensitive resources.

4.13.4 Alternative B

SD/MAs are considered unique in some respect and contain specific management prescriptions to protect or preserve certain resources or resource uses. Some of the resources for which SD/MAs are designated include, but are not limited to, wildlife, scenic values, cultural and paleontological resources, historic places, wilderness, free-flowing riverways, watersheds, sensitive soils, and vegetation. Designating all priority habitat areas as a sage-grouse conservation ACEC would greatly increase the area for which relevant and important values would be established and protected. Approximately 5,000,400 acres would be added as SD/MAs under this alternative, which would be a significant increase over Alternative A.

Not allowing new surface occupancy within priority habitat, including winter concentration areas, would have similar impacts as prohibiting or restricting surface disturbance under Alternative A, except 4-mile buffers with a cap on surface disturbance of one disturbance per section and no more than 3% total surface disturbance would protect more total area from surface disturbance, which would reduce the impacts described above to SD/MAs from surface disturbance.

Implementing NSO restrictions on existing leases within priority habitat would reduce the total amount of surface disturbance allowed in these areas compared to the density limitations discussed under Alternative A. Placing a limit on the average amount of allowable surface disturbance could result in the relocation or redesign of new development projects or, in some cases, preclude such projects to ensure they do not contribute to the exceedance of the density restrictions. The overall extent of surface disturbances would be reduced compared to Alternative A, which would provide additional protection to the resources and resource uses for which SD/MAs are managed. This would assist in reducing impacts that could occur to undiscovered cultural or paleontological resources and historic places by limiting development and indirectly provide protections to wildlife, vegetation communities, sensitive soils, wild lands, and visual resources. In addition, this could provide protections to the overall character of SD/MAs and indirectly provide assistance in managing primitive and semi-primitive recreational opportunities.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would have similar impacts as under Alternative A, except to a greater extent due to increased areas where surface disturbance is seasonally limited and surface disturbing activities are prohibited.

Expanding ROW exclusion to include all priority sage-grouse habitat (5,271,440 acres), expanding avoidance to all general habitat (6,357,180 acres), and limiting ROWs and transmission projects to designated corridors throughout the planning area (Map 2-10) would reduce the impacts discussed under Alternative A because less area would be available ROWs and new corridors would be prevented, which could otherwise cross or run adjacent to SD/MAs.

Effects from pursuing land acquisitions would have a similar impact to SD/MAs as under Alternative A, except that more acquisitions would be pursued.

Approximately 6,886,890 acres would be closed to oil and gas leasing, and 2,117,160 acres would be managed with NSO stipulations. This would reduce the short-term surface disturbance by 20% from Alternative A to 104,050 acres and reduce the long-term disturbance by 14% to 33,530 acres. Overall, 11,555 oil and gas wells (15% fewer than Alternative A) and 2,154 CBNG wells (22% fewer than Alternative A) are projected over the life of the plan under Alternative B. This would reduce the overall impacts discussed under Alternative A, decrease the level of human presence and the use of heavy equipment in these areas, and reduce the potential for impacts to undiscovered cultural or paleontological resources and historic places, as well as provide indirect protections to wildlife, vegetation communities, sensitive soils, wild lands, recreational values, and visual resources.

Not allowing exceptions to lease stipulations, COAs, and T&Cs in priority habitat would restrict and, in some cases, preclude development related to oil and gas. In turn, this would reduce surface disturbance within SD/MAs, indirectly providing additional protections to many of the resource and resource uses for which SD/MAs are managed including, but not limited to, unidentified cultural or paleontological resources and historic places, wildlife, vegetative communities, sensitive soils, wild lands, recreational values, and visual resources.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to SD/MAs as Alternative A.

Limiting noise to 10 dB at active lek perimeters would be similar to impacts identified under Alternative A. This would result in additional protections to SD/MAs that are managed for wildlife and primitive to semi-primitive recreational opportunities.

Wind energy development as discussed under Alternative A would be excluded within priority habitat (Map 2-30). For the entire planning area, the number of wind turbines would be reduced from 1,254 under Alternative A, to 127 (a 90% reduction). The exclusion of potential wind energy development would decrease visual, noise, and traffic impacts to primitive and semi-primitive recreation opportunities discussed under Alternative A. This would indirectly provide additional protections to the resources and resource uses of SD/MAs that allow for wind development.

Determining core habitat areas to be unsuitable for coal leasing, closing these areas to non-energy mineral leasing (Map 2-24), withdrawing the lands from locatable mineral entry (Map 2-19), and closing lands to mineral material exploration, sales and free use permits (Map 2-14) would reduce the occurrence of these types of mineral development compared with Alternative A, which would prevent impacts from related surface disturbance in SD/MAs.

4.13.5 Alternative C

The effects of designating ACECs and SIAs would have the same impact to SD/MAs as under Alternative B, except Audubon Important Bird Areas would also be designated. This would further increase areas for which relevant and important values would be established and protected. Approximately 6,423,374 acres would be managed as SD/MAs under this alternative, which represents an increase of 1,397,821 acres compared to Alternative B.

Not allowing new surface occupancy within priority habitat, including winter concentration areas (timing and distance stipulations) would be the same as under Alternative B.

Seasonal timing and distance limitations on priority habitat, occupied leks, sage-grouse nesting/early brood-rearing habitat, winter habitat, and winter concentration areas would have the same impact to SD/MAs as Alternative B, except that requirements would be extended to disruptive activities as well, which could reduce noise, traffic, and human presence. This would be an indirect benefit to some special designation values, such as areas where wildlife or solitude and unconfined recreation experiences are values.

Expanding ROW exclusion to include all priority and general sage-grouse habitat (11,556,490 acres, expanded from Alternative B) (Map 2-11) and limiting ROWs and transmission projects to designated corridors (same as Alternative B) would reduce the impacts from ROWs discussed under Alternative A, more than under Alternative B.

Effects from pursuing land acquisitions would have the same impact to SD/MAs as Alternative B.

Oil and gas leasing would not be open on any areas within priority and general sage-grouse habitat under Alternative C (Map 2-6). This would remove impacts discussed under Alternative A for all oil and gas development, except for that associated with valid existing leases. This would reduce the short-term surface disturbance by 35% from Alternative A to 85,140 acres and reduce the long-term disturbance by 31% to 27,030 acres. Overall, 9,533 oil and gas wells (30% fewer than Alternative A) and 1,594 CBNG wells (42% fewer than Alternative A) are projected over the life of the plan under Alternative C. Lease buy outs in priority and general habitat would prevent development of some oil and gas leases, which could indirectly prevent more of the impacts discussed under Alternative A.

Not allowing exceptions to lease stipulations, COAs, and T&Cs in both priority and general habitat would expand the protection of SD/MAs from mineral development to these areas. This would increase the areas protected over both Alternatives A and B.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to SD/MAs as Alternative A.

Impacts from minimizing noise levels would have the same impact to SD/MAs as Alternative B.

Siting wind turbines at least 5 miles from active leks could reduce impacts to SD/MAs from wind turbines in some areas, but could increase them in areas where there are no active leks (Map 2-31). For the entire planning area, the number of wind turbines would be reduced from 1,254 under Alternative A, to 127 (a 90% reduction and the same as Alternative B). The exclusion of potential wind energy would decrease visual, noise, and traffic impacts to primitive and semi-primitive recreation opportunities discussed under Alternative A. These actions would indirectly provide additional protections to many of the special values and uses for which the SD/MAs are managed by reducing the potential of surface disturbing activities.

Prohibiting industrial solar projects in ACECs and occupied habitat would reduce potential renewable energy development in those areas. This could include decreased potential for impacts to undiscovered cultural or paleontological resources, reductions in stress to wildlife, and the decreased potential for disturbance and degradation of vegetation communities, sensitive soils, wild lands, recreational values, and visual resources.

Impacts from coal leasing; non-energy leasable minerals (Map 2-25); locatable mineral entry (Map 2-20); and mineral material exploration, sales, and free use permits (Map 2-15) would have the same impact to SD/MAs as under Alternative B.

4.13.6 Alternative D

Not designating sage-grouse conservation ACEC/SIAs would have the same impact as Alternative A.

Impacts from restricting surface disturbance (Map 2-2) would have similar impacts as described in Alternative A, except 75,870 acres would be restricted and none would be prohibited. This could allow for impacts to SD/MAs to occur in some areas otherwise protected under Alternative A, but areas within sage-grouse core and connectivity habitat would be more protected from activities that would degrade special management values.

Density limitations of 3 locations per 640 acres and a 9% disturbance cap within core habitat would limit noise, visual impacts, user conflict, and traffic congestion impacts from development activities, but less so than NSO restrictions under Alternatives B and C.

Seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A in some areas and remove them in others. The overall impact of seasonal restrictions would be similar to those impacts discussed under Alternative A.

Managing core and connectivity habitat areas as ROW exclusion areas (5,230,110 acres) (Map 2-12), with 1,300,510 acres as avoidance outside core and connectivity areas would increase the effects described under Alternative A. Inside core and connectivity areas, impacts to SD/MAs would be the same as Alternatives B and C. In general habitat areas, impacts to SD/MAs would be the same as Alternative A. The management of ROW corridors would have the same impact to SD/MAs as Alternative A.

Effects from pursuing land acquisitions would have the same impact to SD/MAs as Alternative A.

Areas closed to oil and gas leasing would be expanded to include Raven Creek in the Newcastle Field Office and 3 areas in the Pinedale Field Office, which would increase the total area to 964,860 acres (Map 2-7). This would reduce impacts from minerals management on SD/MAs from Alternative A, but not by nearly as much as Alternatives B and C. Estimated short-term surface disturbance would be reduced by 6% from Alternative A to 122,910 acres and long-term disturbance would be reduced by about 3% to 37,720 acres. Overall, 13,083 oil and gas wells (only 4% fewer than Alternative A) and 2,686 CBNG wells (only 3% fewer than Alternative A) are projected over the life of the plan under Alternative D.

Impacts from exceptions to lease stipulations, COAs, and T&Cs would have the same impact to SD/MAs as under Alternative A.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to SD/MAs as Alternative A.

Impacts from minimizing noise levels would have the same impact to SD/MAs as Alternative A.

Avoiding wind turbines in core and connectivity habitat unless it can be shown that sage-grouse populations would not decline would reduce the total number of wind turbines in the planning area (Map 2-32) to 980 (a 22% reduction from Alternative A). This would reduce the amount of surface disturbance and would provide indirect protections to managing resource values and uses for which many of the SD/MAs are managed.

Impacts from coal leasing would be of the same type as described under Alternative A, but on less area. Coal leasing would occur on more area than Alternatives B and C, thus the impacts on SD/MAs would be greater than those alternatives. Non-energy leasable minerals (Map 2-26) would be allowed on approximately the same area as Alternative A, but with more mitigation aimed at protecting sagebrush habitat, which would reduce impacts to SD/MAs as well. Locatable mineral entry (Map 2-21), mineral material exploration, sales, and free use permits (Map 2-16) would have the same impact to SD/MAs as under Alternative A.

4.13.7 Proposed Land Use Plan Amendments

The effects of designating SD/MAs would have the same impact to SD/MAs as under Alternative D.

Prohibiting surface disturbing activities on 337,860 acres (Map 2-3) would have the same impacts as described in Alternative A, except 269,310 more acres would be prohibited. Restricting surface disturbance on 160,630 acres (Map 2-3) would have the same impact as described in Alternative A, except impacts would occur on 67,050 additional acres.

Density limitations of one oil and gas or mining location per 640 acres and a 5% disturbance cap within PHMAs (core only) would have impacts similar to those described under Alternative D, but to a larger area. Less surface disturbance would be allowed, which would protect the values for which SD/MAs are designated.

Seasonal restrictions in sage-grouse nesting/early brood-rearing habitat and winter concentration areas would expand the seasonal timing and distance impacts described under Alternative A. Timing and distance impacts would be greater than Alternative D, but less than Alternatives B and C.

The management of ROW exclusion areas (285,930 acres) and avoidance areas (6,208,990 acres) (Map 2-13) within PHMAs and GHMAs would be similar to those discussed under Alternative A, except avoidance areas would be expanded by 3,748,650 acres. This would increase the amount of area in which ROWs would be restricted and possibly precluded, which would reduce related effects on SD/MAs. The management of ROW corridors would have the same impact to SD/MAs as Alternative A.

Effects from pursuing land acquisitions would have the same impact to SD/MAs as Alternative A.

Approximately 883,670 acres would be closed to oil and gas leasing (Map 2-8), which is about the same as under Alternative A (871,780 acres closed to oil and gas leasing). Although areas closed to oil and gas leasing would be approximately the same, other restrictions such as NSO and CSU would be greatly increased to 441,690 and 6,438,480 acres, respectively, which would further protect SD/MA values. Estimated short-term surface disturbance would be reduced by 14% from Alternative A to 112,327 acres and long-term disturbance would be reduced by about 9% to 35,432 acres. Overall, 12,355 oil and gas wells (10% fewer than Alternative A) and 2,462 CBNG wells (11% fewer than Alternative A) are projected over the life of the plan under the Proposed LUP Amendments. This would be more protection than Alternatives A and D, but less than Alternatives B and C.

Impacts from exceptions to lease stipulations, COAs, and T&Cs would have the same impact to SD/MAs as under Alternative A.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same impact to SD/MAs as Alternative A.

The impacts on SD/MAs resulting from minimizing noise levels near sage-grouse leks would be similar to those described under Alternative A, except the level of protection would increase. Limiting noise levels at the perimeter of sage-grouse leks to not exceed 10 dBA above ambient noise would further assist in maintaining the natural primitive and semi-primitive conditions of the SD/MAs.

Avoiding wind turbines in PHMAs unless it can be shown that sage-grouse populations would not decline would reduce the total number of wind turbines in the planning area (Map 2-33) to 127 (a 90% reduction from Alternative A). This would significantly reduce the amount of surface disturbance and would provide indirect protections to managing resource values and uses for which many of the SD/MAs are managed.

Impacts from coal leasing and non-energy leasable minerals would have the same impact to SD/MAs as Alternative D. Withdrawing areas within PHMAs from locatable mineral entry and requiring stipulations for mineral material exploration, sales, and free use permits would reduce impacts to SD/MAs compared to and as described under Alternative A.

4.14 SPECIAL STATUS SPECIES

This section presents potential impacts on Special Status Species implementing management actions presented in Chapter 2. Existing conditions concerning Special Status Species are described in Chapter 3 (Section 3.12).

Special status species are those listed as threatened or endangered, are proposed for listing, or are candidates for listing under the provisions of the ESA; those listed by a state implying potential endangerment or extinction (i.e., NSS); or those designated by the BLM State Director as sensitive. The BLM defines sensitive species as those that could easily become endangered or extinct in a state unless protection is granted. Designated sensitive species are provided the same level of protection by the BLM as federal candidate species. In compliance with the ESA, BLM will evaluate all proposed actions to determine if individuals or populations of federally listed species or their habitat, including designated critical habitat, may be affected (BLM Manual 6840). Forest Service Sensitive Species are those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by: a) Significant current or predicted downward trends in population numbers or density; b) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution; c) The species' population or habitat is stable but limited.

Over the life of the plan, some species that are currently considered sensitive, or not formally included in BLM's or the Forest Service sensitive species list, may be listed under the ESA. Some currently listed species may be delisted during the life of the plan. Most species that are delisted or downgraded from federally proposed or candidate status will be included on the Forest Service and BLM sensitive species list.

Because the purpose of the LUP Amendments is for the management and conservation of Greater Sage-Grouse habitats, a separate analysis for Greater Sage-Grouse has been included under each alternative within this section. For each alternative, impacts for all Special Status Species will be described first followed by a subsection for impacts specific to Greater Sage-Grouse and their habitat.

4.14.1 Impact Indicators

Indicators of impacts on wildlife and fisheries are as follows:

- Acres and condition of native vegetation communities
- Degree/magnitude/level of connectivity between sagebrush and other native vegetation communities
- Degree/magnitude/level of human presence
- Degree/magnitude/level of surface disturbance and vegetation removal
- Introduction or development of non-natural structures or items into the native habitat.

4.14.2 Assumptions

The analysis is based on the following assumptions:

- Special status fish and wildlife populations would continue to be managed by WGFD. BLM and Forest Service would continue to manage species' habitat.

- USFWS would have jurisdiction over the management of federally listed fish, wildlife and plant populations, critical habitat, and migratory birds.
- Natural variability in wildlife health, population levels, and habitat conditions would continue. Periods of mild or severe weather as well as outbreaks of wildlife disease or insects/diseases that impact habitat (e.g., mountain pine beetle, blister rust, mistletoe, and bleeding rust) could impact wildlife population levels.
- Impacts to special status wildlife species are primarily based on potential impacts to habitats that the BLM or Forest Service manages.
- Precise, quantitative estimates of impacts generally are not possible because the exact locations of future actions are unknown, population data for special status wildlife species are often lacking, or habitat types affected by surface-disturbing activities cannot be predicted.
- Actions impacting one species have similar impacts on other species using the same habitats or areas.
- The more acreage of habitat protected, the greater the benefit to the targeted species.
- Sage-grouse core and connectivity habitat areas and other management actions for Greater Sage-Grouse that preclude or restrict development, including those not specifically aimed at conserving Special Status Species, are assumed to benefit Special Status Species where populations overlap with Greater Sage-Grouse core and connectivity habitat.
- Impacts from management for oil and gas development would only apply to new leases; existing development or existing leaseholders would not be impacted by these alternatives, unless specifically described under the management actions.
- Prohibiting all disturbing and disruptive activities in Greater Sage-Grouse winter habitats is more beneficial to Greater Sage-Grouse than avoiding these activities.
- Removal of sagebrush habitat would have a long-term adverse impact on sage-obligate species.
- Measures to protect Greater Sage-Grouse would benefit all sagebrush-dependent species.
- Because of the migratory nature and relative mobility of some special status wildlife species (e.g., waterfowl, neo-tropical migrants, and raptors), these species also would be impacted by actions on non-BLM lands or non-National Forest System lands. Adverse impacts to special status wildlife during different life stages on non-BLM-administered lands can reduce populations regardless of BLM or Forest Service protective measures.
- The total amount of new surface disturbance allowed by an alternative is a good index of potential impacts to Special Status Species. Success of reclamation measures prescribed as a condition of development is unknown, and could underestimate the potential impact of surface disturbance on Special Status Species populations.
- The health of fisheries within the planning area is directly related to the overall health and functional capabilities of riparian/wetland resources, which in turn reflect watershed health.

- Any activities that affect the ecological condition of the watershed and its vegetative cover would directly or indirectly affect the aquatic environment. The degree of impact attributed to any one disturbance or series of disturbances is influenced by location within the watershed, time and degree of disturbance, existing vegetation, and hydrologic condition.

- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

The main habitat of concern in the LUP Amendments is sagebrush or areas with mixed sagebrush habitat components. Habitat such as forests and waterways may occur inside Greater Sage-Grouse core habitat areas but may not be used by Greater Sage-Grouse. Species that use forests, alpine areas, or waterways may benefit or be impacted indirectly from management of Greater Sage-Grouse core habitat areas. Without knowing where disturbing activities are going to occur in the future, making predictions of impacts to various habitat and the species that utilize them could be inaccurate. Since the focus of the amendments is on Greater Sage-Grouse and sagebrush habitat; the Special Status Species included in this analysis will be mainly those that spend a major portion of their life history in sagebrush or mixed sagebrush habitat.

An analysis of the impacts to the Forest Service sensitive species for the Bridger Teton National Forest, the MBNF, and the TBNG can be found in the Biological Evaluation in Appendix M.

4.14.3 Alternative A

In the BLM Field Offices, MBNF, and within Greater Sage-Grouse core habitat in BTNF, existing ROWs would be used whenever possible for placement of new linear facilities. Exceptions could occur, and in those cases, disturbance is to be limited and mitigated. Where existing ROWs occur, disturbance to important sagebrush habitat would likely be minimal due to the conditions of ROW corridors where the land, usually within a two-mile wide pathway, has been previously disturbed from prior facility construction. Species associated with grassland areas, such as swift fox, long-billed curlew, mountain plover, and burrowing owl could be disturbed or forced to abandon habitat if development within existing ROWs occurred. Construction activities could disturb other Special Status Species; possibly causing species vacate the area to lower quality habitat. Moving from desirable habitat can result in reduced health of animals, making them susceptible to disease or predation. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. Some actions such as construction of pipelines, buried fiber-optic lines, and other subsurface actions likely would have short-term impacts, because proper reclamation should restore some level of habitat function in these areas that could be used by wildlife. Because of the long time frames required for some disturbed sites to return to pre-disturbance vegetation cover or the re-disturbance of a ROW corridor, certain impacts could be long term. Any surface disturbance or vegetation loss could impact special status plants from habitat loss, damage, or invasive, non-native plant species which could change habitat composition and function, making habitat inhospitable for native plant species.

Aboveground ROW actions, such as communication sites and power lines, would have long-term potential for collision or electrocution of bats, raptors, and other avian species. New utility towers could provide hunting perch sites for hawks, falcons, or eagles but could increase the danger of electrocution or collisions with transmission lines. Small mammals could be at a greater threat of predation in these areas and could abandon areas as new transmission towers are constructed.

In case-by-case situations within the planning area where new ROWs are allowed to be developed, vegetation loss, habitat degradation, and invasion of exotic plant species could occur. Loss or degradation of habitat would impact terrestrial wildlife species and could force wildlife to move to other less desirable habitat for foraging or cover. New linear disturbances would introduce additional fragmentation into the

landscape. Habitat fragmentation occurs when a contiguous habitat is intersected, divided, or segmented by disturbing activities. Fragmentation causes a reduction in usable ranges and the isolation of smaller, less mobile species; a loss of genetic integrity within species or populations; and an increase in abundance of habitat generalists that are characteristic of disturbed environments (i.e., competitors, predators, and parasites) (Harris 1984). Closing Bates Hole and Sand Hills Management Area in the Casper Field Office to new corridor designations would prevent habitat loss from linear ROW within the areas and could protect wildlife habitat from removal, loss, degradation, and invasion of exotic plant species. Wildlife species that use sagebrush habitat for food or shelter, such as Brewer's sparrow, sage sparrow, and sage thrasher would benefit from management within the Bates Hole area (WGFD 2010c).

Within the planning area, 285,930 acres are currently managed as ROW exclusion areas and 2,460,340 acres are managed as avoidance areas. Lands within the exclusion and avoidance areas would be managed to prevent habitat loss from linear ROWs and could protect special status wildlife habitat and plants from removal, loss, degradation, and invasion of exotic plant species. Prohibiting new above ground structures would also prevent new habitat loss, disturbance, or life-cycle disruption; all of which would protect wildlife habitat. Linear corridors are desirable areas for predatory animals, such as hawks and swift fox. Reducing these areas may be beneficial to prey species (pygmy rabbit, white-tailed prairie dog) but could also reduce hunting corridors for the predators. Preventing overhead structures could reduce the risk of predation from avian predators (eagles, hawks, falcons), but also prevent the construction of overhead perches for hunting raptors. The risk of collision or electrocution of raptors, migratory bird, and bat species could be reduced where overhead structures are not allowed. Maintenance and upgrades of existing structures could result in short-term disturbance of special status wildlife from human and vehicle activity, but long-term impacts would be minimal.

Within the Kemmerer field office, new utility lines would be buried or anti-perching devices would be installed within sagebrush and/or semiarid shrub-dominated habitats. Anti-perch devices could protect small mammals from predation by raptors, ravens, or crows. Buried utility lines could prevent collision or electrocution of special status bats or bird species from suspended wires.

Within the planning area, 1,254 wind turbines are estimated to be developed. In Alternative A, 424,820 acres are excluded from wind energy and 2,438,850 acres are avoided from development of wind energy. The development of wind energy could cause habitat loss, and both short and long-term impacts to special status wildlife or plants. Large wind energy fields also involve surface disturbance, which could permanently change the habitat structure, affecting special status wildlife or plants. Disturbance during installation of towers, roads, and infrastructure could force special status wildlife away from habitat. Some smaller prey species will avoid and abandon areas where overhead structures are present, such as power lines and towers, due to the increased risk of avian predators. However, overhead structures could provide perches for hunting raptors or other predatory birds.

Initial construction may result in displacement of some special status wildlife and raptor species from breeding and foraging habitat within the construction area. Construction of wind turbines throughout the planning area may create collision hazards for special status raptors, bats, and multiple avian species. Studies have documented deaths of special status avian and bat species from wind turbines, although the levels of collision and death vary in the scientific research (Cohn 2008, Madders and Whitfield 2006). Collision levels fluctuate based on habitat, terrain, elevation, and even weather conditions (Madders and Whitfield 2006). Prediction of accurate bird or bat losses from wind development is currently not available, however; it can be assumed that some losses of these species will occur. Bats most commonly found within wind farms with the highest mortality are the eastern red bat and hoary bat, a Special Status Species, which are found within the planning area (Cohn 2008).

Restrictions on MET towers in Kemmerer and Rawlins could reduce impacts to Special Status Species by preventing the perching of raptors and removing collision obstacles within sagebrush habitat. Buffer distances between 0.25 and one mile from occupied leks could reduce perceived or actual threats to small mammals such as pygmy rabbit or Idaho pocket gopher from overhead predation from raptors or other predatory birds.

Land disposals within the Casper field office could impact Special Status Species depending on the parcel of land and the entity which acquires the land. Most land disposals do not occur without review for major impacts to Special Status Species. Land acquisitions within the Casper field office could impact Special Status Species depending on the resources found on the parcel of land. Acquisitions could lead to obtaining valuable habitat for Special Status Species where possible.

Using the BLM policy in IM No. WO-2009-007 and BLM Handbook H-4180-1 and the equivalent Forest Service Annual Operating Instructions to evaluate land health standard achievement in Greater Sage-Grouse core habitat could identify where land health standards are not being met. If appropriate action is taken by issuing a decision to modify grazing, constructing management facilities, or implementing treatments, impacts to Special Status Species from livestock grazing could be reduced. Impacts from standards not being met include habitat loss or degradation for special status plants and animals, reduction of forage or cover vegetation for special status wildlife, and spread of invasive, non-native plant species, which can impact habitat for special status plants and wildlife. Soil erosion or compaction of soils may also lead to habitat loss and damage to water sources. Implementation of management practices for non-conformance could reduce effects to special status habitat from the impacts described above.

Adjustments in grazing use or management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands could also result in actions that could balance the impacts of grazing while sustaining wildlife species and their habitat. Making adjustments to grazing management as a result of monitoring could provide overall improvements in landscape health, prevent or reduce the spread of invasive, non-native plant species, provide additional forage, and allow for greater cover habitat for Special Status Species.

Forest Service livestock grazing practices to provide adequate forage, cover, and other habitat needs for Greater Sage-Grouse could provide forage and cover for other sagebrush dependent species such as swift fox, Idaho pocket gopher, ground nesting birds such as Columbian Sharp-Tailed grouse, and Mountain Plover (WGFD 2010), and could protect special status plant species that occur within sagebrush ecosystems.

Implementing conversions in types of livestock and grazing season of use to meet rangeland standards could maintain a higher level of habitat function for wildlife and livestock use. Managing season of use in sagebrush habitat could allow for grazing to be applied during timeframes to support seasonal habitat for sage-grouse and could provide important habitat components for special status wildlife species (Cagney et al. 2010). Conversions in types of livestock could alter grazing patterns and vegetation use. For example, cattle use in areas where grasses could be reduced and forbs increased; sheep use where forbs could be reduced and grasses increased (Beck and Mitchell 2000).

Water developments could affect special status wildlife habitat through reductions in forage due to increased distribution of animals or trampling of vegetation or could increase the potential for the spread of West Nile virus. However, implementation of the Wyoming Standards for Healthy Rangelands on BLM-administered lands could ensure that habitat for special status plants and wildlife species is not degraded by over-use of livestock. Adverse impacts of fences on wildlife within the planning area would be minimal because of requirements that fences are located so as not to impede wildlife movement and that the fences be removed, modified, or reconstructed where documented conflicts with wildlife occurred. Future

livestock conversions (sheep to cattle or vice versa) would be carefully analyzed. Sustainability reviews would be required before conversions, which could benefit the rangelands and some Special Status Species.

Management of livestock allotments within the Casper field office and BTNF and TBNG for drought conditions could provide important seasonal forage, cover, or habitat protection for Special Status Species during periods of drought.

Range improvement projects within the planning area could initially cause short-term impacts from habitat loss or damage during the improvement construction or project timespan. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. Long term, many improvements could provide additional vegetation for forage or cover, increased access to the landscape, additional water resources, or access to mineral supplements. In TBNG and MBNF, where wildlife escape ramps are required in stock water troughs and tanks, the potential for drowning by birds and small mammals could be reduced or prevented.

Fence modification, removal, or construction of new fences to BLM standards would provide varying impacts to wildlife species. Fences can provide Special Status Species with less competition from livestock for forage when fences exclude livestock from grazing habitat. Fences can also impact special status wildlife by creating travel barriers, altering distribution patterns, increasing stress and energy loss, and causing injury or death from collision or entanglement. Modifying or constructing fences to BLM standards could reduce impacts to special status wildlife from fences by decreasing the chances of entanglement. Where fences are constructed with perch inhibitors for raptors, prey species would be less likely to be subject to hunting from predatory bird species; however, predatory birds would not benefit from hunting perches. Where fences were constructed with anti-collision standards for Special Status Species, they would be less likely to be injured or perish from impact with fences. Removal of fences reduces threats of injury or death from impacts to fences, opens up travel corridors, and could allow special status wildlife access to additional forage and cover.

Within the Casper, Kemmerer, and Pinedale Field Offices, prohibiting the placement of mineral supplements within 0.25 miles (this distance may be greater in the TBNG or MBNF) of lentic/lotic water and wetland/riparian areas would prevent stream bank erosion, vegetation loss, and nutrient loading in surface water, preserve aquatic habitats, and prevent the degradation of sensitive habitat. Mineral supplement blocks for livestock and wildlife use would be placed in locations that both promote proper grazing distribution and prevent inappropriate livestock use on riparian habitat, minimizing soil compaction and runoff near surface waters, and could decrease grazing pressure and competition for riparian vegetation.

Current management for livestock trailing in Casper, Kemmerer, and Pinedale could impact Special Status Species from movement of herds through habitat, causing loss of vegetation for forage and cover, soil compaction, erosion, trampling of vegetation and habitat, and the spread of invasive non-native plant species.

Managing riparian and wetland areas for PFC/WY Standards for Rangeland Health/improving habitat conditions could decrease runoff, sedimentation, and cementation of substrates in-stream channels, which could provide preferential habitat conditions for aquatic species for feeding, cover, and reproduction. Maintaining or improving riparian and wetlands could improve water quality; reduce the likelihood of stream bank erosion, stream channel alteration, and loss of wetland or riparian vegetation. Improving habitat conditions could maintain or improve riparian/wetland areas, which are important to special status plants such as persistent sepal yellowcress, meadow pussytoes, and Ute ladies' tresses and wildlife such as Preble's meadow jumping mouse, Yellow-billed Cuckoo, Columbia spotted frog, or a variety of cutthroat trout species. Habitat and forage could be enhanced from careful, seasonal management of wetland and riparian areas by applying short-duration grazing, preventing or limiting utilization of woody species, and

seasonal use regimes. Because livestock and wildlife can tend to congregate near water sources, management focused toward riparian and wetland areas could reduce heavy impacts from soil compaction, erosion, and overgrazing of vegetation resources which could improve overall habitat conditions in these areas for Special Status Species.

In the Rock Springs Field Office, where water developments are proposed or considered in sensitive wildlife habitat and are developed where wildlife could benefit from the development, short-term impacts could occur from the initial construction, human presence, habitat disturbance, and vegetation loss. Special status wildlife could vacate the area until construction of improvements was complete. During this time Special Status Species could be forced to inhabit lower quality habitat for forage or cover, which could impact health and reproduction until species could return to the area. Once construction was complete, habitat conditions in the area would return over time if grazing was monitored and over-use of the area by livestock did not occur. Access to water sources would be beneficial to terrestrial wildlife. However, water developments could also adversely affect vegetation through reductions in forage due to increased distribution of animals. However, implementation of the Wyoming Standards for Healthy Rangelands on BLM-administered lands could ensure that habitat for Special Status Species is not degraded by over-use of livestock. Any shallow areas of water are susceptible to mosquito breeding and possible spread of West Nile virus could occur (Cagney et al. 2010). Within the MBNF, water developments would be kept out of riparian and wetland areas where feasible, which could reduce the impacts to Special Status Species from habitat loss, West Nile virus, or reductions in forage in those areas.

Allowing exceptions to lease stipulations, COAs and T&Cs to be considered on a case-by-case basis for sage-grouse habitat could allow for additional surface disturbing activities in sagebrush habitat which creates disturbance from roads, structures, power lines, and human activity and could disrupt contiguous, uninterrupted habitat and result in overall habitat loss. It is unknown, however, what type or degree of exceptions would occur, because the outcome is dependent on each lease and the habitat where the lease is being developed.

It is estimated that a total of 16,411 oil, gas, and CBNG wells would be developed under Alternative A within the planning area. There would be 130,330 acres of initial surface disturbance and 39,050 acres of long-term disturbance from oil and gas development. The primary impacts on wildlife species from minerals development within the planning area would be the reduction in usable wildlife habitat and disruption of migration corridors that link crucial habitats for Special Status Species such as Columbia Sharp-tailed Grouse. Reductions could be particularly severe in areas with continuous surface disturbance. As discussed by Bartmann et al. (1992), crowding of animals may have a density-dependent impact of reducing animal survival and damaging resources. Human disturbance of wildlife results in increased energy costs to the alerted animal (Bromley 1985). The disturbed animal can incur a physiological cost either through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential (Geist 1978).

Closing 871,780 acres to new oil and gas leasing could help protect these areas from future development by providing unfragmented blocks of habitat and migration corridors between habitat areas, as well as reducing habitat loss and disturbance from humans and infrastructure. Under Alternative A, 40,980 acres would be managed as NSO areas, and 5,015,210 acres would be managed as CSU areas.

Fluid mineral leasing could cause changes to important Special Status Species habitat components, population function, and fragment remaining habitat. This could potentially reduce survivability and breeding of affected wildlife populations. Authorized wells would not be anticipated to directly affect species populations given the review and stipulations placed upon each permit; however, population

function could be impacted as development increases due to habitat fragmentation or habitat loss. Risks to special status wildlife from oil, gas, and CBNG development include elevated mortality due to collisions with structures and vehicles, risk of West Nile virus due to increased mosquito habitat from holding ponds, disturbance of some wildlife that may force them into suboptimal habitats with elevated predation rates (resulting in a decline in habitat suitability), and direct habitat loss (Walker et al. 2007). The construction phase of well development (drilling and completion), which typically takes 1-2 months for a single drill bore (but can extend up to 14 months or more for a multiple drill hole well pad), is a period of high intensity human activity, noise, road and equipment use, and site disturbance. This period could affect special status wildlife especially if it coincides with seasons when species might already be stressed.

Human disturbance near raptor and other bird nest sites, such as the bald eagle and sage thrasher, could result in the abandonment of the nest; high nestling mortality from overheating, chilling, or desiccation when young are left unattended; premature fledging; and ejection of eggs or young from the nest. Avian species that successfully nest during a disturbance may abandon the nesting territory the following year. Responses of nesting birds to human disturbance typically are determined by the type, duration, magnitude, noise level, and timing of activity relative to nesting phenology. Although some level of habituation to disturbance could occur, repeated flushing of adult raptors, and other special status birds, increases energy expenditure during foraging and decreases energy ingestion, depleting energy reserves and resulting in premature mortality during harsh conditions. Evidence suggests that some falcons and owls are generally more tolerant of human-induced disturbance and human environments; northern goshawks appear much less tolerant; and buteos exhibit a wide range of acceptance levels; however, some speculate that ferruginous hawks should be considered the raptor most sensitive to human disturbance. Raptors are less tolerant of disturbance when populations of prey species are at low levels (Romin and Muck 2002).

Geophysical exploration can impact Special Status Species in many ways. Use of vehicles for seismic projects or vibroseis trucks in the open landscape could crush vegetation or special status plants, and human and vehicle presence could cause wildlife to vacate the area. During this time, wildlife could be forced to inhabit lower quality habitat for forage or cover, which could impact health and reproduction until species could return to the area. Once exploration was complete, habitat conditions in the area would return over time, depending on habitat and weather conditions. Seismic lines from vibroseis trucks can open up corridors that could be used by predatory animals. Vehicles could cause mortality by crushing nesting birds or colliding with wildlife. Areas where geophysical operations were prohibited totally, through buffer distances, or seasonally (Pinedale, March 1 to May 15; 8:00 am to 8:00 pm) could provide special status plants or wildlife protection from the impacts listed above.

Working with project proponents in siting projects in locations containing the least sensitive habitats to minimize impacts to sensitive resources could reduce loss of higher quality habitat for special status wildlife that use or inhabit these areas and may allow for contiguous, uninterrupted habitat and protection for special status plants. Contiguous, uninterrupted habitat protects special status wildlife from human and other disturbance and allows for corridors for migration and travel. Disturbance can result in wildlife moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a decline in wildlife populations.

Requiring reclamation bonds for drilling or surface disturbance provides insurance that funding is available for reclamation and compliance of the lease terms if a leaseholder abandons the project without conducting proper surface reclamation and other project requirements. Reclamation bonds could provide wildlife with habitat improvement and recovery in areas disturbed by oil, gas, and other surface disturbing activities if project abandonment occurs.

Disposal of produced water from CBNG can be treated and disposed of in several different ways in Wyoming, depending on location and quality of the water. If treated properly, disposal of water into

waterways or through reinjection should not impact wildlife due to water quality. However, injection facilities have continued human presence and truck traffic. Careful placement of future water injection wells is essential for the continued protection of sensitive habitats and future wildlife population expansion. Discharge of produced water resulting from CBNG extraction to surface water features could affect aquatic habitat by altering local hydrologic conditions of receiving water bodies. If disposal pits are used for produced water, impacts to wildlife could occur if ponds were not managed properly. Produced water from producing natural gas wells can be highly alkaline and contain very high concentrations of salt (USFWS 2006b). If Trumpeter Swans or other wetland species were to enter the ponds, they could accumulate high concentrations of salt in their feathers, which could cause them to drown from the excess weight. If water was ingested, the salts could accumulate in their tissues, which could cause damage if toxic levels built up. The risk of West Nile virus due to increased mosquito habitat from holding ponds may also affect special status bird species.

Managing split estate lands within the Pinedale field office subject to the same stipulations as leased federal estate lands could provide additional protections to Special Status Species and their habitat through federal oil and gas lease stipulations provided in the Pinedale RMP. Negotiating federal management for non-federal minerals under federal ownership in MBNF could provide additional protections to Special Status Species and their habitat through federal oil and gas lease stipulations provided in the MBNF LRMP.

In areas considered suitable for further consideration for coal leasing and development, appropriate mitigation measures to protect sage-grouse and Special Status Species would be attached to any issued coal lease. Effects to special status wildlife habitat could be extensive, depending on the type (surface/subsurface) and location of the coal development. Coal leasing would result in mining activities which could cause displacement of special status wildlife from developed areas, avoidance of a larger area around the development because of human presence and noise, and possible offsite impacts, including erosion, and spread of invasive, non-native plant species. Depending on the scale and location of the disturbance to critical special status wildlife habitats, the effects could be more immediate. Allowing coal exploration activities in Greater Sage-Grouse core habitat could cause short-term impacts to wildlife from human or vehicle presence, disturbance or removal of vegetation during exploratory drilling, and noise from vehicles and equipment, all of which could cause Special Status Species to abandon the area. Special status plant species could be affected if surface coal mining were to occur within plant locations. Surveys for threatened and endangered species would occur before operations start and plant habitat would be identified and protected.

The leasing of non-energy leasable minerals within core habitat for Greater Sage-Grouse would be considered within areas available for leasing. Under Alternative A, 261,000 acres are closed to non-energy, solid leasable mineral leasing. Allowing prospecting for new leases could be considered on a case-by case basis. Most of the non-energy leasable mineral resources within the planning area are trona and phosphate. Trona mining occurs in primarily sub-surface mines where disturbance to Special Status Species habitat is low. Human presence and vehicle use from the mine to processing areas could cause displacement of special status wildlife from vehicles and noise, avoidance of a larger area around the development because of human presence, vehicles and noise, and possible collisions from vehicles. Vehicle routes are prone to use by predators, which could benefit special status predators, but would likely impact prey species (pygmy rabbit, prairie dogs) from predation. Impacts from phosphate would be similar although more habitat impacts from loss, disturbance, and erosion could occur from open pit mining. Special status plant species could be affected if surface mining were to occur within plant locations. Surveys for threatened and endangered species would occur before operations start and plant habitat would be identified and protected.

The portions of the planning area in Greater Sage-Grouse core habitat withdrawn from locatable mineral entry (1,892,620 acres) would continue to have protection of sensitive resources, and would prevent effects from mineral extraction to Special Status Species habitat.

Salable minerals within Greater Sage-Grouse habitat would be continue to be open where authorized. Impacts could include removal or damage of special status plants, displacement of special status wildlife from exploration or pit areas, avoidance of a larger area around the development because of human presence and noise, and possible offsite impacts, including erosion, and spread of invasive, non-native plant species. Currently, 472,800 acres are closed to mineral material exploration, sales, and free use permits. These areas would not have impacts to Special Status Species from mineral material activity.

Allowing salable mineral pits to persist after they are no longer in use could reduce short-term impacts of reclamation from human and vehicle presence; however, depending on how the area is used after minerals are no longer removed, impacts could be varied. If the area is allowed to naturally reclaim, impacts to Special Status Species habitat could be low aside from possible spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species. If the area is used for recreation or does not naturally reclaim, erosion, sediment runoff, and spread of invasive, non-native plant species could occur, impacting Special Status Species and habitat use.

Dispersed recreation activities that increase human presence could have a localized impact on special status wildlife habitat. Displacement from human and vehicle activities moves special status animals into less desirable habitat and increases competition for available resources with other species and uses. Spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species could occur from vehicles and human tracking from one area to another and could impact both special status plants and wildlife. Allowing SRPs for large events or events that involve surface disturbing activity could lead to direct or indirect impacts on special status wildlife and plant habitat, particularly in areas that contain known or potential populations and habitats. Impacts to wildlife occur from displacement and physiological stress from human presence and activity during sensitive life stages. Stipulations placed on SRPs in accordance with federal protections and BLM or Forest Service policy for water, soils, and Special Status Species would minimize the potential for impacts to special status habitat. Restrictions of SRPs within two miles of active Greater Sage-Grouse display grounds from March 1 to June 15 in the TBNG would reduce impacts to habitat within and adjacent to those areas.

OHV use within OHV "open" areas could impact special status wildlife by increasing human presence and noise and increasing the potential for animal-vehicle collisions. The open OHV areas in the Casper, Rawlins, and Rock Springs field offices: Poison Spider OHV Park (285 acres); Dune Pond Cooperative Management Area (3,736 acres); and the portion of the Greater Sand Dunes Recreation Area (529 acres) have large areas of sand dunes as the open use area, which is not desired habitat for most special status wildlife species. Because these areas are existing use areas, it is likely that most special status wildlife have already abandoned use or avoid the area. Sand dune-obligate species, specifically blowout penstemon and dune wildrye could be killed or damaged by open use of sand dunes from OHVs if plant species were to occur in these areas. Off road, open OHV use in areas outside of the dune areas can degrade vegetation and lead to erosion and habitat loss, reduced quality of habitat, and lead to the introduction and spread of invasive, non-native plants that can further degrade habitat quality and change habitat composition.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within Greater Sage-Grouse core and connectivity habitats, could limit impacts to Special Status Species from vehicle use. The miles of routes that could be limited cannot be determined until transportation planning is completed, but limiting new roads, routes, and cross-country travel until the planning occurs could prevent some disturbance to special status wildlife habitat. Cross country vehicle use can open up corridors that could be used by predatory animals, and additional vehicle traffic could use the pathway. Vehicles could cause mortality from crushing nesting birds or colliding with wildlife. Linear disturbances can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss for Special Status Species. Vegetation

loss, erosion, and the spread of invasive, non-native plant species may also occur during or following vehicle passage.

Avoiding surface disturbing activities or occupancy within 0.25 mile of occupied Greater Sage-Grouse leks in Casper (except for Bates Hole and Fish Creek/Willow Creek), Kemmerer, Newcastle, Pinedale (in Traditional Leasing Areas and Unavailable Areas), Rawlins, Rock Springs (including Jack Morrow Hills), and TBNG could prevent habitat loss or human presence within the buffered areas. The 0.25 mile area surrounding the lek would prevent habitat fragmentation and the impacts from surface disturbance, such as vegetation and habitat loss, soil loss and erosion, or the introduction of invasive, non-native plant species such as cheatgrass, which can alter the composition of native species for forage and cover for special status plants and wildlife.

Management in the Bates Hole and Fish Creek/Willow Creek area of the Casper Field Office restricts or prohibits surface disturbing activity within 0.75 miles of occupied Greater Sage-Grouse leks. In areas with over 10% canopy cover, surface disturbing activities would be avoided within four miles of occupied Greater Sage-Grouse leks. The additional 0.5-mile distance from leks, as compared to the other areas under Alternative A, would allow for greater protection from surface disturbing activities, habitat loss, and contiguous habitat areas. The four-mile buffer in areas with over 10% canopy cover would provide habitat protection and connectivity, as well as allowing for minimal disturbance to Special Status Species in these areas.

Closing, rehabilitating, or reclaiming unused roads or trails could provide fewer disturbances from occasional vehicle or human presence and could improve habitat conditions by removing linear disturbances, allowing for greater habitat connectivity, and providing additional vegetation resources for forage or cover. Vehicle routes are prone to use by predators, prey species could benefit from the rehabilitation of unused roads or trails which could reduce the presence of predatory animals. In the Kemmerer field office, not upgrading designated roads could reduce surface disturbance from upgrading activities, preventing vegetation and soil loss, sedimentation, and possible displacement of special status wildlife from human and vehicle presence.

Designing seed mixes or plantings for vegetation types that meet desired future condition (DFC) to use for rehabilitation in the BTNF could lead to habitat re-establishment with appropriate species, which could provide desirable habitat for special status wildlife species. Native species are ideal, but if the nutrition and habitat quality were commensurate with natives, vegetation could benefit special status wildlife and achieve DFCs.

Vegetation treatments for Greater Sage-Grouse and sagebrush within the planning area could provide sagebrush obligate special status wildlife habitat, forage, and cover within these areas. Initial treatments could cause displacement from human and vehicle activities which could move animals into less desirable habitat and could increase competition for available resources with other species and habitat uses. Treatments could affect special status plants if treatment occurred within existing populations. Limiting treatments within sagebrush habitat in the TBNG to 15 to 20% could prevent habitat fragmentation and provide varied vegetation structure within the greater habitat area. Limiting prescribed burns to specific canopy cover, vegetation composition, patch size, or amount of precipitation within sagebrush habitat could cause vegetation treatments to be maximized for the conditions and habitat structure. Habitat for Special Status Species could benefit from carefully managed prescribed burn treatments as described above. Special status species plants could be damaged or lost due to prescribed burn treatments if plants were within the treatment areas.

Depending on the extent, location, severity, and seral type affected, unplanned ignitions would have short-term impacts on special status wildlife species. It would do this by removing or degrading habitat for some

species, injuring or killing slow-moving species, causing habitat avoidance and changes in species movement patterns, or reducing population viability and increasing the contribution to the need to list a species. In areas that are available for fuels treatments, changes in vegetation can result in negative impacts on special status wildlife species, such as direct habitat loss, habitat fragmentation, and disruption to species; however, it can also result in beneficial impacts, such habitat restoration.

A concern of resetting vegetation seral stage through fuels management is the invasion of undesirable plant species. Noxious and invasive weeds are often of lower value to wildlife and degrade wildlife habitat by reducing optimal cover or food. Sagebrush-steppe communities are among the ecosystems most vulnerable to invasion and degradation by invasive weeds. Cheatgrass invasion is also a threat to some treatment areas. Invasive non-native plants with little or no forage value for special status wildlife species are increasing in some areas. The greatest impacts have occurred on winter range areas with low precipitation rates. Not only can invasive species outcompete most native plants when moisture is limited, they can also change site-specific fire ecology and result in the loss of critical shrub communities. Cheatgrass may provide some short-term forage benefits to special status wildlife species while in early stages of growth; however, it lacks the ability to provide high quality forage during most of the year.

Fire suppression removes vegetation and disturbs soil and can have both short- and long-term impacts on special status wildlife and other habitats. For example, using heavy equipment to construct fire lines can cause habitat loss, degradation, and fragmentation in the short term. Moreover, if not rehabilitated, these fire lines can cause erosion and provide opportunities for the spread of undesirable plant species, thereby resulting in long-term adverse impacts on wildlife habitat. Timely rehabilitation following fire, therefore, is important to maintaining the quality of wildlife habitats.

The noise from heavy equipment and chainsaws could temporarily disperse bird species from breeding and nesting habitat and wildlife from occupied habitat. Prescribed burning could also disturb nesting bird species. These activities could remove suitable habitat or other desirable vegetation. Disturbances from heavy equipment, chainsaws, and prescribed burning would be localized and short-term. Most wildlife species would move into adjacent untreated areas; however, direct mortality during the vegetation treatments is possible. Timing limitations (such as those for big game birthing areas, raptor nesting, and big game winter habitat), as well as site-specific COAs (e.g., timing limitations for migratory bird nesting), could mitigate the short-term impacts resulting from the treatments.

ESR treatments following a wildfire are effective in restoring wildlife habitat, but equipment is often noisy, and noise may alter animal behavior or cause wildlife to leave an area during the disturbance. These impacts would be short-term and are not likely to have much effect on the long-term health and habitat use of wildlife in the treatment area.

Although both planned and unplanned wildland fire adversely impacts wildlife habitats in the short-term by removing vegetation and disturbing soil, the long-term benefits of wildland fire often outweigh the short-term adverse impacts. For example, prescribed fire can be used to restore conditions benefiting wildlife species favoring early plant succession stages and young age classes of woody plants (McAninch et al. 1984). Prolonged fire suppression has allowed fuels to build up to the point that an unplanned wildfire is likely to be much larger and greater in intensity.

Some wildlife species thrive on the occurrence of fire. The herbaceous and woody plants that establish following a burn provide abundant foliar tissue and seeds, which are used by small rodents and birds that in turn are important prey for a variety of avian and mammalian predators. Over the short-term, the wildlife community is changed dramatically by a fire, as taller and denser vegetation is replaced by a more open habitat. As the area gradually recovers, however, many of the pre-fire components become reestablished, and the area again supports a community associated with denser forests. This cycle may take decades or

centuries, depending on the dominant plant species, or it might never occur if climatic conditions are no longer suitable for the former dominants.

Wallmo (1980) suggests that fire improves the palatability of forage and causes browse plants to resprout close to the ground, putting the current season's growth within reach of deer for several years. Additionally, wildland fire can improve the quality of wildlife habitat by releasing soil nutrients, reducing fuel load, or setting back trees encroaching into shrubland or grassland habitats.

Fuels treatments could be beneficial for species that depend on younger seral stages. In the long-term, wildlife would benefit from most wildfires and fuels management due to an increase in vegetation productivity and to increased plant diversity and age classes, which would, in turn, provide additional forage, cover, and prey base.

Mimicking natural periodic disturbance is often necessary in order to stimulate plant productivity, increase diversity, and increase nutritional value. Foraging opportunities for big game and other herbivores would increase as understory grasses, forbs, and shrubs reestablish. The benefits for mule deer and elk are likely to be long-term. Directly following application of fire there is generally more palatable browse available for wild ungulates. Improving vegetation in upland areas would provide more forage to big game species and other herbivorous species that occur in these areas and would result in direct beneficial impacts. In addition, fuels treatments in upland areas often increase forage production, which diverts livestock and wildlife use from riparian and wetland areas, thereby increasing the vigor and structural diversity of these plant communities.

Following a wildfire, ESR is implemented to protect and conserve habitats that have sustained damage or degradation from catastrophic wildfire. Typically these activities are beneficial for special status wildlife species and are designed to improve the overall condition of the area, which in turn improves habitat for wildlife. For example, weed-free seeding would stabilize soil and reduce the spread of noxious weeds. Additionally, replacing organic matter in disturbed areas would protect topsoil and provide a suitable bed for the restoration of a native vegetative community. Alternative A would have the fewest restrictions for fuels management actions and the most potential for vegetation disturbance. Additionally, Alternative A would not prioritize habitat restoration beyond what has already been determined in the fire management plans for the area; therefore, Alternative A would have the greatest impact on special status wildlife.

Resting treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Rested areas could provide special status wildlife with new vegetation for habitat or forage without competition with livestock during the rest period. Not allowing treatments in known Greater Sage-Grouse winter habitat in the TBNG with the exception to strategically reduce wildland fire risk could protect habitat components important to sagebrush obligate species, such as sage sparrow, Brewer's sparrow, and pygmy rabbit.

Reclamation of sage-grouse habitats in accordance to the Wyoming Reclamation Policy (BLM 2009a) could provide sufficient restoration of habitat following oil, gas, and other surface disturbing activities. If the policy is followed, prevention of erosion and the introduction of exotic or invasive plant species could be minimized. The landscape could be reclaimed to the original habitat components and structure to the extent possible and could provide habitat for sagebrush obligate or other Special Status Species. While the initial disturbance would result in habitat loss, over the long term, sagebrush habitat could be restored; although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas.

Use of weed-free seed and mulch, desirable non-native species or sterile perennials, or reclaiming to native site plant composition for reclamation projects could reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Areas that restore with native plant composition provide habitat and cover for Special Status Species and could support special status plant and wildlife populations in the future.

Working with stakeholders to control grasshoppers and Mormon crickets in the Casper Field Office could impact some special status wildlife from the loss of insects as an important food source. However; major infestations could result in vegetation loss from insect consumption of plants, which could also impact wildlife from loss of forage, and could result in losses of special status plants. Impacts to Special Status Species from pesticide spraying can cause short-term displacement from vehicle use and human presence.

In the Rock Springs Field Office, management of wild horses to consider wildlife, watershed, and other resource needs could provide Special Status Species wildlife with adequate forage, habitat cover and water, and could provide habitat protection for special status plants. Water developments to improve herd distribution and manage forage utilization for wild horses could reduce grazing pressure possibly providing additional forage and habitat for special status wildlife.

Using wildfire for resource benefit can result in short-term impacts from habitat loss, habitat fragmentation, displacement of special status wildlife to less desirable, lower quality habitat, soil erosion, and sedimentation. Invasive, non-native plant species can become established in disturbed areas, which can alter native plant composition, reducing forage, and cover species for special status wildlife and threatening persistence of special status plants. In the long term, wildfire for resources benefit may result in strong, healthy native plant composition returning to burned areas, providing special status wildlife with preferred forage and cover vegetation. Rehabilitation for areas burned by wildland fires (Kemmerer, Newcastle, and Rawlins) to prevent further resource damage could protect special status wildlife habitat from erosion and landslides that could result in habitat loss and runoff into riparian and aquatic ecosystems. Sediment and runoff could impact aquatic species and special status fish. Use of prescribed fire as a management tool can remove decadent or undesirable vegetation, promote new growth of fire-adapted plant species, or can be used for general fuels reduction in sensitive or at-risk areas. Prescribed fire can also introduce varied successional stages of plants within habitat areas. New growth and varied successional stages of vegetation provide special status wildlife with both forage and cover. Short-term impacts from prescribed fire are the same as described above for wildland fire use. Suppression techniques could impact special status plants and wildlife in areas where they occur. Vegetation removal, crushing of habitat, the use of heavy equipment and fire retardant and human presence, could force special status wildlife from the area where these activities occurred to less desirable, lower quality habitat until these areas have recovered.

Prioritizing Bates Hole and Fish Creek/Willow Creek for vegetative treatments to improve Greater Sage-Grouse habitats could be effective in controlling invasive annual plant species, such as cheatgrass, by using herbicides. If treatments were effective, sagebrush ecosystems could recover and provide habitat and forage for sagebrush obligate special status wildlife species. Using monitoring to ensure residual herbaceous vegetation is maintained for nesting cover in Greater Sage-Grouse habitat within these areas could help retain some effective habitat components in treatment areas and provide vegetation for special status wildlife.

Offsite mitigation for oil and gas development in the Pinedale Field Office could provide improvements to Special Status Species which inhabit those areas being mitigated. The initial mitigation projects could displace special status wildlife species from human and vehicle presence, causing wildlife to flee to other, possibly lower quality habitat. Displacement could cause short-term impacts from stress from fleeing or

inadequate forage, shelter or breeding habitat. Long term, special status wildlife could benefit from mitigation of habitat with increased forage, shelter, or breeding habitat.

Avoiding surface disturbing activities within 0.25 miles of occupied Greater Sage-Grouse leks in Casper (except for Bates Hole and Fish Creek/Willow Creek), Kemmerer, Newcastle, and Rock Springs Field Offices (93,580 total acres; Map 2-1) and prohibiting surface disturbing activities within 0.25 miles of occupied Greater Sage-Grouse leks in Pinedale (in Traditional Leasing Areas and Unavailable Areas), Rawlins, and Jack Morrow Hills (within the Rock Springs field office), and TBNG (68,550 acres; Map 2-1) could prevent habitat loss or human presence within the buffered areas. The 0.25-mile area surrounding the lek could prevent habitat fragmentation and the impacts from surface disturbance such as vegetation and habitat loss, soil loss and erosion, or the introduction of invasive, non-native plant species such as cheatgrass, which can alter the composition of native species for forage and cover for special status plants and wildlife. Management in the Bates Hole and Fish Creek/Willow Creek area of the Casper Field Office restricts or prohibits surface disturbing activity within 0.75 miles of occupied Greater Sage-Grouse leks. In areas with over 10% canopy cover, surface disturbing activities would be avoided within four miles of occupied Greater Sage-Grouse leks. The additional 0.5-mile distance from leks, as compared to the other areas under Alternative A, would allow for protection from surface disturbing activities, habitat loss, and reduction of contiguous habitat. The four-mile buffer in areas with over 10% canopy cover would provide ideal habitat protection and connectivity, as well as allowing for minimal disturbance to special status wildlife species within or nearby these areas.

Providing buffers around sage-grouse leks in all BLM field offices and the TBNG under Alternative A would help reduce habitat fragmentation around leks. Buffers around leks can provide undisturbed corridors for special status wildlife species to travel, feed, and use for cover. The buffer areas could also provide protective habitat for sensitive plant species such as meadow milkvetch or largeflower triteleia.

In Greater Sage-Grouse core, general, and connectivity habitat, avoiding surface-disturbing and disruptive activities in suitable Greater Sage-Grouse nesting and early brood-rearing habitats within two miles of an occupied lek, or in identified Greater Sage-Grouse nesting and early brood-rearing habitat outside the two-mile buffer from March 15 to July 15 in the Casper, Kemmerer, Newcastle, and Pinedale field offices (Traditional Leasing Areas and Unavailable Areas) and in the TBNG and MBNF planning units from March 1 to June 15 could reduce the level of noise, disturbance or disruption to special status wildlife species during the specified timeframes (Table 4-107). In addition to the buffer area, the limitation of human presence during the timing limitations (early morning and late evening) would add an additional reduction of disturbance to special status wildlife, especially those species with nocturnal habits such as owls or bats. In the Rawlins Field Office, the restrictions are similar except that there are additional restrictions for geophysical surveys and organized recreational activities that require a SUP which could protect sagebrush obligate Special Status Species from these additional disturbing activities.

Surface-disturbing and disruptive activities in Greater Sage-Grouse winter concentration areas would be avoided from November 15 to March 14 in the Casper, Kemmerer, and Newcastle Field Offices. In the Bates Hole and Fish Creek/Willow Creek area winter habitat is CSU for surface disturbing activities in sagebrush stands of more than 20% canopy cover. In the Pinedale, Rawlins and Rock Springs field offices, winter protections occur within winter concentration areas. In the Pinedale, Rawlins, and Rock Springs field offices, the timing is also from November 15 to March 14. Within the remainder of the Rock Springs Field Office, restrictions are on a case-by-case basis. Winter habitat contains specific areas of sagebrush, which rise 10-14 inches above the snow where Greater Sage-Grouse can feed on sagebrush leaves and buds (BLM 2009b). Special status species such as the pygmy rabbit, which inhabit dense, mature sagebrush would benefit from protections to winter habitat.

Minimizing impacts from predators, such as minimizing creation of new roads and requiring raptor perch deterrents on power poles as a component of permit issuance or renewal, could affect prey species such as prairie dogs, pygmy rabbit, or Idaho pocket gopher by reducing predation to the species. However, there could be effects to special status predators (swift fox, Bald Eagle, Ferruginous Hawk), in extreme cases, removal and death.

Noise minimization could reduce disturbance to wildlife species (Kemmerer, Pinedale and TBNG). Specific limitations, such as limiting noise to 49 decibels (10 dBA above background noise) from March 1 to June 15 or within two miles of a Greater Sage-Grouse lek (TBNG), could reduce disturbance to special status wildlife species. While most wildlife will flee from sounds made by human presence, it is unknown how most special status wildlife react to sustained noise within their local habitat. Noise minimization can reduce stress responses, prevent a reduction in reproductive success, and prevent decreased immune response (Pater et al. 2009).

Greater Sage-Grouse–Alternative A

Greater Sage-Grouse populations across the West have declined over the last half of the century due to factors such as habitat degradation, fragmentation, and loss (Crawford et al. 2004, Holloran 2005). As oil and gas development has increased in Wyoming, so has the concern over how this type of development might affect Greater Sage-Grouse populations. Impacts from fluid mineral development on Greater Sage-Grouse populations in developed fields could include habitat loss from well, road, pipeline, and transmission line construction; displacement from increased human activity and associated noise; increased illegal harvest; and mortality associated with evaporation ponds and increased exposure to predation (Braun 1986, Schroeder et al. 2004). Greater Sage-Grouse are dependent on sagebrush habitats year-round (Patterson 1952). Habitat loss and degradation, as well as loss of population connectivity, have been identified as important factors contributing to the rangewide decline of Greater Sage-Grouse populations (Braun 1998, Wisdom et al. 2002).

Sage-grouse are a sensitive species on the BTNF, MBNF, and TBNG, and are so designated by the Regional Foresters in Regions 2 and 4. The Forest Service Manual (FSM 2670) provides guidance for the management of sensitive species such that any management actions that may impact individuals and may cause a trend toward federal listing or loss of population viability would result in a “significant effect.” Actions for managing sensitive species on Forests and any proposed actions in Greater Sage-Grouse habitat may be mitigated at the project level if unacceptable adverse effects are identified. Thus, many of the generalized adverse effects on National Forest System lands identified in Alternative A may be mitigated at the project level.

In the BLM Field Offices, MBNF, and within Greater Sage-Grouse core habitat in TBNG, existing ROWs would be used whenever possible for placement of new linear facilities. Exceptions could occur, and in those cases, disturbance is to be limited and mitigated. Where existing ROWs occur, disturbance to important sagebrush habitat would likely be minimal due to the conditions of ROW corridors where the land, usually within a two-mile wide pathway, has been previously disturbed from prior facility construction. Human presence, vehicles, and equipment would cause disturbance and noise, which could force Greater Sage-Grouse to abandon the area either temporarily or permanently. Habitat abandonment could lead to successful relocation if nearby habitat is available; or a move to lower quality habitat where survival or reproduction could be diminished from physiological stress or lack of forage and cover (Blickley et al. 2012).

New utility towers could provide perch sites for raptors that prey on Greater Sage-Grouse, possibly resulting in increased predation. In addition, if grouse experience or perceive a greater threat of harassment and/or predation, they might avoid areas with overhead structures. In TBNG and in case-by-case situations within

the planning area, new ROWs are allowed to be developed, and could cause vegetation loss, habitat degradation, and invasion of exotic plant species. If construction of new ROW corridors were to occur, the resulting fragmentation of formerly intact habitat can affect Greater Sage-Grouse populations by severing migration routes to seasonal habitat areas such as winter habitat and nesting or early brood rearing areas. Closing Bates Hole to new corridor designations would prevent habitat loss from linear ROW within the area and could protect Greater Sage-Grouse habitat from removal, loss, degradation, and invasion of non-native plant species.

Within the planning area, 285,930 acres are currently managed as ROW exclusion areas and 2,460,340 acres are managed as avoidance areas. Lands within the exclusion and avoidance areas would be managed to prevent habitat loss from linear ROWs and could protect Greater Sage-Grouse from habitat removal, loss, or degradation, and the spread of invasive, non-native plant species. Prohibiting new above ground structures would also prevent new habitat loss, disturbance, or life-cycle disruption, all of which would protect Greater Sage-Grouse. The lack of elevated structures of various types would reduce perch sites for raptors that prey on grouse, protecting Greater Sage-Grouse from the threat of additional predation. Linear corridors are desirable areas for predatory animals, such as raptors and red fox, reducing these areas could be beneficial to Greater Sage-Grouse by preventing predation. Preventing overhead structures in these areas could reduce the risk of actual or perceived threats of overhead predation. The risk of collision or electrocution of Greater Sage-Grouse could be reduced where overhead structures are not allowed. Maintenance and upgrades of existing structures could result in short-term disturbance of habitat from human and vehicle activity, but long-term impacts would be minimal.

Within the Kemmerer field office, new utility lines would be buried or anti-perching devices would be installed within sagebrush and/or semiarid shrub-dominated habitats. Anti-perch devices could protect Greater Sage-Grouse from predation by raptors, ravens, or crows. Buried utility lines could prevent collision or electrocution of Greater Sage-Grouse from suspended wires.

Within the planning area, 1,254 wind turbines are estimated to be developed. In Alternative A, 437,120 acres are excluded from wind energy and 2,438,850 acres are avoided from development of wind energy. The development of wind energy would cause habitat loss and both short and long-term impacts to habitat for Greater Sage-Grouse. Disturbance during installation of towers, roads, and infrastructure could force Greater Sage-Grouse away from habitat within at least 0.25 miles of the construction. Greater Sage-Grouse will avoid and abandon areas where overhead structures, such as power lines, occur due to the increased risk of predation from raptors; and are also at risk of collisions with vehicles, guy-wires, and fences (Walker et al. 2007). Habitat that Greater Sage-Grouse use for leks is within elevated or flat grassland sites with few vertical obstructions, areas that are also prime lands for the installation of wind turbines (Strickland et al. 2011). Although there is no conclusive evidence that wind energy developments cause reductions in Greater Sage-Grouse lek numbers, because the species is sensitive to disturbance and habitat fragmentation, there is a high likelihood that Greater Sage-Grouse would be impacted by wind energy development.

Restrictions on MET towers in Kemmerer and Rawlins could reduce impacts to Greater Sage-Grouse by preventing the perching of raptors and removing collision obstacles within sagebrush habitat. Buffer distances between 0.25 and one mile from occupied leks could prevent perceived or actual threats to Greater Sage-Grouse from overhead predation from raptors or other predatory birds.

Land disposals within the Casper field office could impact Greater Sage-Grouse depending on the parcel of land and the entity that acquires the land. Most land disposals do not occur without review for major impacts to wildlife, Special Status Species, and species habitat. Land acquisitions within the Casper Field Office could impact Greater Sage-Grouse depending on the resources found on the parcel of land. Acquisitions could lead to obtaining valuable habitat for Greater Sage-Grouse where possible.

Using the BLM policy in IM No. WO-2009-007 and BLM Handbook H-4180-1, and the equivalent Forest Service Annual Operating Instructions to evaluate land health standard achievement in Greater Sage-Grouse core habitat could identify where land health standards are not being met. If appropriate action is taken by issuing a decision to modify grazing, construct management facilities, or implement treatments, impacts to Greater Sage-Grouse from livestock grazing could be reduced. Impacts from standards not being met include habitat loss or degradation, reduction of forage or cover, and spread of invasive plant species, which could cause Greater Sage-Grouse to abandon an area. Implementation of standards could reduce effects to Greater Sage-Grouse from the impacts described above.

Adjustments in grazing use or management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands could also result in actions that would balance the impacts of grazing while sustaining sagebrush habitat. Making adjustments to grazing management as a result of monitoring could provide overall improvements in landscape health, prevent or reduce the spread of invasive, non-native plant species, provide additional forage, and allow for greater cover habitat for Greater Sage-Grouse.

In the Pinedale Field Office, twenty grazing allotments (283,510 acres) (Appendix G) do not meet one or more of the Land Health Standards due at least in part to livestock grazing. Changes in grazing management on these allotments could benefit sage-grouse habitat in two major ways. First, for allotments failing the riparian standard, changes in grazing management could result in more vigorous riparian vegetation communities and more stable streambanks, resulting in improved foraging habitat for sage-grouse broods in late summer. Second, for allotments failing the upland vegetation or wildlife habitat standards, changes in grazing management could result in increased vigor and density of native, mid-stature perennial bunchgrasses such as bluebunch wheatgrass, king spike fescue, Indian ricegrass, and needle and thread, which provide important horizontal cover for nesting and early brood rearing periods. Changes in upland plant community composition would be slow and might not be measureable for years or decades; however, increased vigor of plants already present would result in a shorter time frame.

Forest Service livestock grazing practices to provide adequate forage, cover and other habitat needs for Greater Sage-Grouse could provide Greater Sage-Grouse with habitat for nesting and forage during lekking and nesting. Greater Sage-Grouse nests typically range from 2.1 to 4.8 miles or more from their lek area; the three-mile buffer distance for TBNG for sagebrush cover greater than 15% surrounding leks would provide necessary habitat sufficient for a large number of nesting and breeding birds (WGFD 2010c).

Implementing conversions in types of livestock and grazing season of use to meet rangeland standards could provide adequate habitat components for Greater Sage-Grouse. Managing season of use in sagebrush habitat could allow for grazing to be applied during timeframes that would not affect sage-grouse forage or cover needs such as in winter concentration areas or riparian areas in the spring and summer (Cagney et al.2010). Conversions in types of livestock could alter grazing patterns and vegetation use. For example, cattle use in areas where grasses could be reduced and forbs increased; sheep use where forbs could be reduced and grasses increased (Beck and Mitchell 2000). Careful use of conversions is necessary to ensure that needed habitat components for Greater Sage-Grouse would be available during the seasons when the birds need it.

Management of livestock allotments within the Casper field office and BTNF and TBNG for drought conditions could provide important seasonal forage and cover for Greater Sage-Grouse during periods of drought.

Range improvement projects within the planning area could initially cause short-term impacts from habitat loss or damage during the improvement construction or project timespan. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. Long term, many improvements could provide additional

vegetation for forage or cover, increased access to the landscape, additional water resources, or safety features for Greater Sage-Grouse.

Fence modification, removal, or construction of new fences to BLM standards would provide varying impacts to Greater Sage-Grouse. Fences can provide sage-grouse with fewer impacts from livestock from grazing or trampling of cover and forage when fences exclude livestock from Greater Sage-Grouse habitat. Fences can also impact Greater Sage-Grouse by creating travel barriers, altering distribution patterns, increasing stress and energy loss, and causing injury or death from entanglement or collisions. Modifying or constructing fences to BLM standards could reduce impacts to Greater Sage-Grouse from fences by decreasing the chances of collision or entanglement only if they were also fitted with anti-collision markers. Studies in Wyoming show that fence markers can reduce sage-grouse mortality from wire fence collision by 70-83% (Christiansen 2009, Stevens et al. 2012). Where fences were constructed with anti-collision standards for Special Status Species, Greater Sage-Grouse could be less likely to be injured or perish from impact with fences. Where fences are constructed with perch inhibitors for raptors, Greater Sage-Grouse would be less likely to be subject to hunting from predatory bird species. Removal of fences reduces threats of injury or death from impacts to fences, opens up travel corridors, and could allow access to additional forage and cover.

Prohibiting the placement of mineral supplements within 0.25 miles of lentic/lotic water and wetland/riparian areas, as well as Greater Sage-Grouse leks, could prevent damage to important riparian areas, late season brood rearing habitat, trampling and degradation of wetlands, and overall habitat loss. Mineral supplement blocks for livestock and wildlife use would be placed in locations that both promote proper grazing distribution and prevent inappropriate livestock use on riparian habitat, minimizing soil compaction and damage to vegetation, and could decrease grazing pressure and competition for riparian vegetation. Water developments could also adversely affect Greater Sage-Grouse habitat, particularly in nesting habitat and riparian areas, through reductions in forage, cover, or possible nest trampling due to increased distribution of animals. However, implementation of the Wyoming Standards for Healthy Rangelands on BLM-administered lands could ensure that habitat for Greater Sage-Grouse is not degraded by over-use of livestock. In TBNG and MBNF, where wildlife escape ramps are required in stock water troughs and tanks, the potential for drowning of sage-grouse could be reduced or prevented.

Current management for livestock trailing in the Casper, Kemmerer, and Pinedale field offices could impact Greater Sage-Grouse depending on timing and where the trailing occurred. Trailing can result in vegetation loss from livestock use or trampling, generally species (forbs, grass, or sagebrush) that Greater Sage-Grouse use for either forage, cover, or both. Reduction of vegetation could also result in fewer insects, which could be detrimental to sage-grouse if it occurred in early or late brood rearing habitat. Some trampling of nests or nesting habitat is possible if trailing were to occur within nesting habitat or near leks in the spring (March to May). Livestock trailing could also lead to the spread of invasive, non-native plant species which can overtake native habitat and lead to loss of native forbs and grasses, which are important for Greater Sage-Grouse forage and cover.

Managing riparian and wetland areas for PFC/WY Standards for Rangeland Health/improving habitat conditions could maintain or improve riparian/wetland areas which are important to Greater Sage-Grouse for summer-late brood-rearing habitat (Connelly et al. 2000). Riparian habitat is critical to Greater Sage-Grouse for late-growing season foraging (Crawford et al. 2004). Habitat and forage could be enhanced from careful, seasonal management of wetland and riparian areas from applying short duration grazing, preventing or limiting utilization of woody species, and seasonal use regimes. Because livestock and wildlife can tend to congregate near water sources, management focused toward riparian and wetland areas could reduce heavy impacts from soil compaction, erosion, and overgrazing of vegetation resources which could improve overall habitat conditions in these areas for Greater Sage-Grouse.

In the Rock Springs field office, where water developments are proposed or considered in sensitive wildlife habitat and are developed where wildlife could benefit from the development, short-term impacts could occur from the initial construction, human presence, habitat disturbance, and vegetation loss. Once construction was complete, habitat conditions in the area could return over time if grazing was monitored and over-use of the area by livestock or wildlife did not occur. Access to water sources could be beneficial to Greater Sage-Grouse if escape ramps are installed in stock water troughs and tanks to prevent the potential for drowning of sage-grouse. However, water developments could also adversely affect Greater Sage-Grouse, particularly if developments were located in springs, seeps, riparian or wetland areas. Riparian habitat is critical to Greater Sage-Grouse for late-growing season foraging and summer-late brood-rearing habitat (Connelly et al. 2000, Crawford et al. 2004). Because livestock and wildlife can tend to congregate near water sources, careful management would be necessary to ensure that areas surrounding water developments within sagebrush, riparian, or wetland habitat are not over used and/or overgrazed (Crawford et al. 2004). Any shallow areas of water are susceptible to mosquito breeding and possible spread of West Nile virus could occur (Cagney et al. 2010). Within the MBNF, water developments would be kept out of riparian and wetland areas where feasible, which could reduce the impacts to Greater Sage-Grouse from habitat loss, West Nile virus, or reductions in forage in those areas.

Exceptions to lease stipulations considered on a case-by-case basis for Greater Sage-Grouse habitat in all field offices could allow impacts to sagebrush and Greater Sage-Grouse if oil and gas development were to occur near important habitat areas. Impacts could come from surface disturbing activities in sagebrush habitat, which create disturbance from roads, structures, power lines, and human activity, and could disrupt contiguous, uninterrupted habitat and result in overall habitat loss. It is unknown, however, what type or degree of exceptions would occur, because the outcome is dependent on each lease and the habitat where the lease is being developed.

Fluid mineral leasing could cause changes to important Greater Sage-Grouse habitat components, population function, and fragment remaining habitat. This could potentially reduce survivability and breeding of affected Greater Sage-Grouse populations. Authorized wells would not be anticipated to directly affect species populations given the review and stipulations placed upon each permit; however, population function could decline as development increases due to habitat fragmentation or habitat loss (Naugle et al. 2006; Walker et al. 2007). Risks to Greater Sage-Grouse from oil, gas, and CBNG development include elevated mortality due to collisions with structures and vehicles, risk of West Nile virus due to increased mosquito habitat from holding ponds, disturbance of birds that may force them into suboptimal habitats with elevated predation rates (resulting in a decline in habitat suitability), and direct habitat loss (Walker et al. 2007). The construction phase of well development (drilling and completion), which typically takes 1-2 months for a single drill bore (but can extend up to 14 months or more for a multiple drill hole well pad), is a period of high intensity human activity, noise, road and equipment use, and site disturbance. This period is considered one of high impact to Greater Sage-Grouse, especially if it coincides with seasons when the birds might already be stressed (Walker et al. 2007). However, adverse impacts to sage-grouse may continue to occur following the construction phase during normal operations (Holloran 2005; Walker et al. 2007; Doherty et al. 2008). Sage-grouse may simply avoid otherwise suitable habitat as the density of roads, power lines, or energy development increases (Lyon and Anderson 2003; Holloran 2005; Kaiser 2006; Doherty et al. 2008). Abandonment of leks may not occur during the first year of drilling and operations, but often is shown to occur within 2-10 years following well development (Walker et al. 2007, Hess and Beck 2012).

Closing 871,780 acres to new oil, gas, and CBNG leasing would protect these areas, which all occur within Greater Sage-Grouse core habitat. Closing areas to new oil and gas leasing would provide unfragmented blocks of habitat and protect corridors between habitat areas; as well as reducing habitat loss and disturbance from humans and infrastructure. Within the planning area, there would be approximately 130,330 acres of initial short-term surface disturbance as a result of an anticipated 16,411 of oil, gas, and

CBNG wells drilled, with long-term disturbance following reclamation of 39,050 acres. Disturbance to habitats could displace Greater Sage-Grouse, and the possible long-term habitat deterioration could eliminate potential habitat that may provide refuge for Greater Sage-Grouse displaced from current territories. Conversion of large areas to early seral stage vegetation or cheatgrass could occur as well pads are reclaimed. Conversion of large expanses to early seral vegetation could result in additional habitat loss and the resulting population decline of Greater Sage-Grouse if this occurred within severe winter range or nesting habitat (Doherty et al. 2008; Holloran et al. 2005). In addition, female sage-grouse are known to have a high fidelity to their natal nesting habitat; it could be 5-9 years before the nesting population response to a gas field development is realized (Holloran 2005). Yearling female sage-grouse displaced from their natal habitat have been found to have a lower nest initiation rate than those that remained, perhaps because of unfamiliarity with the habitat (Kaiser 2006). Over time, female Greater Sage-Grouse chose nest sites farther from active drilling rigs and producing gas wells, suggesting a long-term avoidance of active natural gas developments (Holloran 2005). Ingelfinger and Anderson (2004) found that for lands within 328 feet of a road or well pad, the density of sagebrush obligate bird species drops by 50% regardless of the amount of activity on the road.

Table 4-105. Acres of Oil, Gas, and CBNG Restricted by Lek Buffers and Greater Sage-Grouse Management

Restriction	Alternative A	Alternative B	Alternative C	Alternative D	Proposed LUP Amendments
Closed	871,780	6,886,890	16,878,220	964,860	883,670
NSO	40,980	2,117,160	2,117,160	-	441,690
CSU	5,015,210	-	-	2,117,990	6,438,480

The use of geophysical exploration in core or general habitat could affect Greater Sage-Grouse and sagebrush habitat. The use of vehicles for seismic projects or vibroseis trucks in the open landscape can crush vegetation, and the temporary human and vehicle presence could cause Greater Sage-Grouse to vacate the area. While exploration was occurring, Greater Sage-Grouse could be forced to flee lower quality habitat for forage or cover, which could impact health and reproduction until species could return to the area, depending on the habitat and time of year. Once exploration was complete, habitat conditions in the area could return over time, subject to habitat and weather conditions. Seismic lines from vibroseis trucks can open up corridors that could be used by predatory animals. Vehicles could cause mortality from crushing nesting birds or from collisions. Areas that where geophysical operations were prohibited entirely, through buffer distances 150 foot wide strip around leks, or seasonally (Pinedale, March 1 to May 15 from 8:00 am to 8:00 pm) would provide Greater Sage-Grouse protection from the impacts listed above.

Offsite mitigation for oil and gas development could affect Greater Sage-Grouse if sagebrush habitat was being replaced, providing additional sagebrush habitat for future use. The initial mitigation projects could displace Greater Sage-Grouse if it occurred near occupied habitat, from human and vehicle presence, causing grouse to flee to other, possibly lower quality habitat. Displacement could cause impacts from stress from fleeing or inadequate forage, shelter or breeding habitat. Long term, Greater Sage-Grouse could benefit from mitigation of habitat with increased forage, shelter, or breeding habitat.

Working with project proponents in siting projects in locations containing the least sensitive habitats to minimize impacts to sensitive resources could reduce loss of higher quality habitat for Greater Sage-Grouse that use or inhabit these areas and may allow for contiguous, uninterrupted habitat. Contiguous,

uninterrupted habitat protects species from human and other disturbance and allows for corridors for migration and travel. Disturbance can result in Greater Sage-Grouse moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a further decline in the species.

Requiring reclamation bonds for drilling or surface disturbance provides insurance that funding is available for reclamation and compliance of the lease terms if a leaseholder abandons the project without conducting proper surface reclamation and other project requirements. Reclamation bonds could provide Greater Sage-Grouse with habitat improvement and recovery in areas disturbed by oil, gas, and other surface disturbing activities if project abandonment occurs. Even though areas may be reclaimed, it is not guaranteed that sage-grouse will return to the area; if they do, they may not repopulate to the same level before habitat disturbance (Connelly et al. 2004, Braun et al. 2002).

If produced water is stored in evaporation ponds or reservoirs, Greater Sage-Grouse could be vulnerable to the threat of West Nile virus if mosquitos were allowed to breed in the holding ponds (Walker et al. 2007).

Managing split estate lands within the Pinedale Field Office subject to the same stipulations as leased federal estate lands could provide additional protections to Greater Sage-Grouse and sagebrush habitat through federal oil and gas lease stipulations provided in the Pinedale RMP. Negotiating federal management for non-federal minerals under federal ownership in MBNF could provide additional protections to Greater Sage-Grouse and sagebrush habitat through federal oil and gas lease stipulations provided in the MBNF LRMP.

If coal lease applications were approved, appropriate mitigation measures would be developed. Effects to Greater Sage-Grouse habitat could be extensive, depending on the type (surface/subsurface) and location of the coal development. Sage-grouse will abandon areas near coal mines but will often return once mining activities are complete, although the population numbers may not return to pre-disturbance levels (Connelly et al. 2000). Coal mining activities could cause displacement of Greater Sage-Grouse from developed areas, avoidance of a larger area around the development because of human presence and noise, and possible offsite impacts, including erosion, and spread of invasive, non-native plant species which could further degrade habitat. Depending on the scale and location of the disturbance to critical sage-grouse habitats, the effects could be more severe or long-term. Allowing coal exploration activities in Greater Sage-Grouse core habitat could cause impacts to Greater Sage-Grouse from human or vehicle presence, disturbance or removal of vegetation during exploratory drilling, and noise from vehicles and equipment, all of which could cause sage-grouse to abandon the area.

The leasing of non-energy leasable minerals within core habitat for Greater Sage-Grouse would be considered within areas available for leasing. Currently, 261,000 acres are closed to non-energy solid leasable mineral development. Allowing prospecting for new leases could be considered on a case-by-case basis. Most of the non-energy leasable mineral resources within the planning area are trona and phosphate. Trona mining occurs in primarily sub-surface mines where disturbance to Greater Sage-Grouse habitat is low. Human presence and vehicle use from the mine to processing areas could cause displacement of Greater Sage-Grouse from vehicles and noise, avoidance of a larger area around the development because of human presence, vehicles and noise, and possible collisions from vehicles. Vehicle routes are prone to use by predators, which could impact Greater Sage-Grouse. Impacts from phosphate would be similar although more habitat impacts from loss, disturbance, and erosion could occur from open pit mining.

The portions of the planning area in Greater Sage-Grouse core habitat withdrawn from locatable mineral entry (1,892,620 acres) would continue to have protection of Greater Sage-Grouse and sagebrush habitat, and would prevent future effects from mineral extraction to Greater Sage-Grouse and sagebrush habitat.

Salable minerals within Greater Sage-Grouse habitat would be continue to be open where authorized. Impacts to Greater Sage-Grouse could include displacement of birds from exploration or pit areas, avoidance of a larger area around the development because of human presence and noise, and the spread of invasive, non-native plant species. Currently, 472,800 acres are closed to mineral material exploration, sales, and free use permits. These areas would not receive the impacts from mineral material activity.

Allowing salable mineral pits to persist after they are no longer in use could reduce short-term impacts of reclamation from human and vehicle presence; however, depending on how the area is used after minerals are no longer removed, impacts could be varied. If the area is allowed to naturally reclaim, impacts to Greater Sage-Grouse and sagebrush habitat could be low aside from possible spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species. If the area is used for recreation or does not naturally reclaim, human presence could persist and prevent Greater Sage-Grouse from returning to the area if sagebrush habitat was in close proximity, and spread of invasive, non-native plant species could occur, further impacting reclamation of native species.

Dispersed recreation activities that increase human presence could have a localized impact on Greater Sage-Grouse and sagebrush habitat. Displacement from human and vehicle activities could move Greater Sage-Grouse into less desirable habitat. Spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species could occur from vehicles and human tracking from one area to another. Campgrounds and roadways provide thoroughfares and areas that attract predators, which could increase predation on sage-grouse (Connelly et al, 2004). Allowing SRPs for large events or events that involve surface disturbing activity could lead to direct or indirect impacts on Greater Sage-Grouse and sagebrush habitat, particularly in areas that contain known or potential populations and habitats. Impacts to Greater Sage-Grouse occur from displacement and physiological stress from human presence and activity during sensitive life stages. Stipulations placed on SRPs in accordance with federal protections and BLM policy for water, soils, and Special Status Species would minimize the potential for impacts to Greater Sage-Grouse habitat. Restrictions of SRPs within 2 miles of active Greater Sage-Grouse display grounds from March 1 to June 15 in the TBNG could reduce or prevent impacts to Greater Sage-Grouse during lekking and nesting and their habitat within and adjacent to those areas.

“Open” OHV areas on BLM lands that occur within or nearby Greater Sage-Grouse habitat could impact sage-grouse from disturbance from human presence and noise, and from possible collisions with vehicles. The open OHV areas in the Casper, Rawlins, and Rock Springs field offices: Poison Spider OHV Park (285 acres); Dune Pond Cooperative Management Area (3,736 acres); and the portion of the Greater Sand Dunes Recreation Area (529 acres) have large areas of sand dunes as part of the open use area, which is not desired habitat for Greater Sage-Grouse. Because these areas are existing use areas, it is likely that sage-grouse have already abandoned use of the area or avoid it during migrations.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within Greater Sage-Grouse priority habitat could limit impacts to Greater Sage-Grouse. Roads and road construction are listed among the main causes of habitat loss and habitat fragmentation for Greater Sage-Grouse (Holloran et al. 2005). The miles of routes that would be limited cannot be determined until transportation planning is completed, but limiting new roads, routes, and cross-country travel until the planning occurs could prevent some disturbance to Greater Sage-Grouse from habitat loss and fragmentation. Cross country vehicle use can cause habitat degradation and open up corridors that could be used by predatory animals and vehicles could cause mortality from crushing nesting birds, eggs, or hatchlings. Linear disturbances can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss and the spread of invasive, non-native plant species may also occur during or following vehicle passage.

Avoiding surface disturbing activities or occupancy within 0.25 miles of occupied Greater Sage-Grouse leks in the Casper (except for Bates Hole and Fish Creek/Willow Creek), Kemmerer, Newcastle, Pinedale (in Traditional Leasing Areas and Unavailable Areas), Rawlins, and Rock Springs (including Jack Morrow Hills), and TBNG would provide some area of protection to sage-grouse from disturbance and habitat fragmentation. Sage-grouse leks within 0.25 miles of natural gas development were shown to have significantly fewer males per lek and lower annual rates of population growth compared to leks with less disturbance (Braun et al. 2002, Holloran 2005). Connelly et al. (2000) recommends that energy related facilities be located at least two miles from active leks in areas where sagebrush habitat components are uniform, and approximately three miles where habitat components are non-uniform (Holloran and Anderson 2005). Declines of Greater Sage-Grouse populations following energy development have been shown through numerous scientific studies (Braun 1986, Remington and Braun 1991, Braun et al. 2002, Holloran 2005, Walker et al. 2007, Hess and Beck 2012). While Alternative A provides a buffer area from surface disturbance or occupancy, it is not of a distance that is recommended by current science and may force Greater Sage-Grouse away from high quality leks to other areas of lower quality habitat and smaller populations of lekking birds. The result of lek disturbance and abandonment is lower reproductive rates of Greater Sage-Grouse, and reduction of sage-grouse populations.

Management in the Bates Hole and Fish Creek/Willow Creek area of the Casper Field Office restricts or prohibits surface disturbing activity within 0.75 miles of occupied Greater Sage-Grouse leks. In areas with over 10% canopy cover, surface disturbing activities would be avoided within four miles of occupied Greater Sage-Grouse leks. The additional 0.5-mile distance from leks, as compared to the other areas under Alternative A, would allow for greater protection from surface disturbing activities, habitat loss, and reduction of contiguous lekking habitat areas. The four-mile buffer in areas with over 10% canopy cover would provide ideal habitat protection and connectivity, as well as allowing for minimal disturbance to Greater Sage-Grouse on leks. Birds in these protected areas are expected to remain/return to leks and continue reproductive activities to maintain or increase population numbers.

Providing buffers around leks for all Field Offices under Alternative A (Table 4-106) would help reduce habitat fragmentation around leks. Buffers around leks can provide undisturbed corridors for female grouse to move from the lek to nesting areas. Areas of habitat connectivity are imperative for Greater Sage-Grouse survival. Walker et al. (2007) recommends large areas with extensive stands of sagebrush of approximately four or more miles around leks to allow breeding populations of Greater Sage-Grouse to return to the lek. The availability of large, uninterrupted areas of sagebrush habitat for sage-grouse to forage and nest is likely to influence the size of the breeding populations and persistence of leks (Swenson et al. 1987, Ellis et al. 1989, Schroeder et al. 1999, Leonard et al. 2000, Smith et al. 2005).

Table 4-106. Buffer Distances for Occupied Leks—Alternative A

Field Office/ Forest Unit	Buffer Distance	Type of Activity
Casper	0.25 miles	Surface disturbance or occupancy
Casper— Bates Hole and Fish Creek/Willow Creek	0.75 miles	Surface disturbance or occupancy
Casper— Bates Hole and Fish Creek/Willow Creek	4 miles	Surface disturbing activities in areas 10% sagebrush cover
Casper— Bates Hole and Fish Creek/Willow Creek	2 miles March 15 to July 15	Avoid surface-disturbing and disruptive activities in suitable sage-grouse nesting and early brood-rearing habitats
Kemmerer	0.25 miles	Surface disturbance or occupancy
Newcastle	0.25 miles	Surface disturbance or occupancy

Field Office/ Forest Unit	Buffer Distance	Type of Activity
Pinedale (Traditional Leasing Areas and Unavailable Areas)	0.25 miles	Surface disturbance
Rawlins	0.25 miles	Surface disturbance or occupancy
Rock Springs	0.25 miles	Surface disturbance or occupancy
Rock Springs— Jack Morrow Hills	0.25 miles or case-by-case	Surface disturbance or occupancy
BTNF	—	Not applicable
TBNG	0.25 miles	New oil and gas facilities (includes roads)
MBNF	—	Not applicable

Closing or rehabilitating unused or reclaiming roads or trails could provide fewer disturbances to greater Sage-Grouse from occasional vehicle or human presence and could improve habitat conditions by removing linear disturbances, allowing for greater habitat connectivity, and providing additional vegetation resources for forage or cover. Vehicle routes can be used by predators (raptors, coyote, red fox, and raven). Greater Sage-Grouse could benefit from the rehabilitation of unused roads or trails, which could reduce the presence of predatory animals. Vehicle routes are prone to the spread of invasive, non-native plant species, which are known to cause changes in native habitat that could damage sagebrush ecosystems that are necessary for Greater Sage-Grouse survival. In the Kemmerer field office, not upgrading designated roads could reduce surface disturbance from upgrading activities, preventing vegetation loss and possible displacement of Greater Sage-Grouse from human and vehicle presence.

Designing seed mixes or plantings for vegetation types that meet DFC to use for rehabilitation in the BTNF could lead to habitat re-establishment with appropriate species, which could provide desirable habitat for Greater Sage-Grouse when sagebrush or other desired habitat were included in the plantings.

Vegetation treatments for sage-grouse and sagebrush within the planning area could provide Greater Sage-Grouse habitat, forage, and cover within these areas within 15 to 25 years for sagebrush, but much shorter term for forbs and grasses. Initial treatments could cause displacement of Greater Sage-Grouse from human and vehicle activities, which could move grouse into less desirable habitat and could increase competition for available resources with other species and habitat uses. Treated areas are vulnerable to the introduction and spread of invasive, non-native plant species. Careful monitoring would be necessary to prevent or limit invasive, non-native plant species within the treated areas. Limiting treatments within sagebrush habitat in the TBNG to 15 to 20% canopy cover could provide varied seral structure within the greater habitat area. Limiting prescribed burns to specific canopy cover, vegetation composition, patch size, or amount of precipitation only where it can be demonstrated to be beneficial to Greater Sage-Grouse could provide some habitat improvements; however, there is little evidence that sagebrush habitat is greatly enhanced by fire treatments, and in some studies, negative effects have been documented (Crawford et al. 2004, Connelly et al. 2004).

Depending on the extent, location, severity of a fire, and seral vegetation (stage or relating to the natural succession within a plant community of an ecosystem) type affected, unplanned ignitions would have short-term impacts on Greater Sage-Grouse. They would do this by removing or degrading habitat, injuring or killing slow-moving animals, causing habitat avoidance and changes in species movement patterns, or potentially reducing population viability. In areas that are available for fuels treatments, changes in vegetation can result in negative impacts on Greater Sage-Grouse, such as direct habitat loss, habitat fragmentation, and disruption to species; however, it can also result in beneficial impacts, such as habitat restoration.

A concern associated with resetting vegetation seral stage through fuels management is the invasion of undesirable plant species. Noxious and invasive weeds are often of lower value to wildlife and degrade wildlife habitat by reducing optimal cover or food. Sagebrush-steppe communities are among the ecosystems most vulnerable to invasion and degradation by invasive weeds. Cheatgrass invasion is also a threat to some treatment areas. The greatest impacts have occurred on Greater Sage-Grouse winter range areas with low precipitation rates. Not only can invasive species outcompete most native plants when moisture is limited, they can also change site-specific fire ecology and result in the loss of critical shrub communities.

Fire suppression removes vegetation and disturbs soil and can have both short- and long-term impacts on Greater Sage-Grouse and their habitats. For example, using heavy equipment to construct fire lines can cause habitat loss, degradation, and fragmentation in the short term. Moreover, if not rehabilitated, these fire lines can cause erosion and provide opportunities for the spread of undesirable plant species, thereby resulting in long-term adverse impacts on Greater Sage-Grouse habitat. Timely rehabilitation following fire, therefore, is important to maintaining the quality of wildlife habitats.

The noise from heavy equipment and chainsaws could temporarily disperse Greater Sage-Grouse from breeding and nesting habitat and from other occupied habitats. Prescribed burning could also disturb nesting bird species, from smoke inadvertently drifting into occupied habitat. These activities also could remove suitable habitat or other desirable vegetation. Disturbances from heavy equipment, chainsaws, and prescribed burning would be localized and short-term. Most wildlife species would move into adjacent untreated areas; however, direct mortality during the vegetation treatments is possible. Timing limitations and site-specific COAs could mitigate the short-term impacts from the treatments.

Using ESR treatments following a wildfire are effective in restoring wildlife habitat; however, equipment is often noisy, and noise may alter animal behavior or cause wildlife to leave an area during the disturbance. These impacts would be short-term and are not likely to have much effect on the long-term health and habitat use in the treatment area. Although both planned and unplanned wildland fire adversely impact wildlife habitats in the short term by removing vegetation and disturbing soil, the long-term benefits of wildland fire often outweigh the short-term adverse impacts. For example, prescribed fire can be used to restore conditions benefiting wildlife species favoring early plant succession stages and young age classes of woody plants (McAninch et al. 1984). Prolonged fire suppression has allowed fuels to build up to the point that an unplanned wildfire is likely to be much larger and greater in intensity. Some wildlife species thrive on the occurrence of fire. The herbaceous and woody plants that establish following a burn provide abundant foliar tissue and seeds. These are more palatable for Greater Sage-Grouse and provide an influx of insects that provide valuable nourishment for Greater Sage-Grouse chicks. Over the short term, the plant community is changed dramatically by a fire, as taller and denser vegetation is replaced by a more open habitat. As the area gradually recovers, however, many of the pre-fire components become reestablished, and the area again supports a healthy plant community. This cycle may take decades or centuries, depending on the dominant plant species. Alternatively, vegetation restoration might never occur if climatic conditions are no longer suitable for the former dominants. Wallmo (1980) suggests that fire improves the palatability of forage and causes browse plants to resprout close to the ground, putting the current season's growth within reach for several years. Additionally, wildland fire can improve the quality of Greater Sage-Grouse habitat by releasing soil nutrients, reducing fuel load, or setting back trees encroaching into shrubland or grassland habitats.

Fuels treatments could be beneficial for species that depend on younger seral stages. In the long term, Greater Sage-Grouse could benefit from some wildfires and most fuels management, due to an increase in vegetation productivity and to increased plant diversity and age classes. This would, in turn, provide additional forage and cover. Mimicking natural periodic disturbance is often necessary in order to stimulate plant productivity and increase diversity and nutritional value. Foraging opportunities for Greater Sage-

Grouse would increase as understory grasses, forbs, and shrubs reestablish. In addition, fuels treatments in upland areas often result in increased forage production, which diverts livestock and wildlife use from riparian and wetland areas, thereby increasing the vigor and structural diversity of these plant communities.

Following a wildfire, ESR is implemented to restore habitats that have sustained damage or degradation from catastrophic wildfire. Typically these activities are beneficial for Greater Sage-Grouse and are designed to improve the overall condition of the area, which improves habitat for wildlife. For example, weed-free seeding would stabilize soil and reduce the spread of noxious weeds. Additionally, replacing organic matter in disturbed areas would protect topsoil and provide a suitable bed for the restoration of a native vegetative community. Alternative A would have the fewest restrictions for fuels management actions, with the most potential for vegetation disturbance. Additionally, Alternative A would not prioritize fire operations beyond what has already been determined in the fire management plans for the area; therefore, Alternative A would have the greatest impact on Greater Sage-Grouse.

Resting treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Beck and Mitchell (2000) recommend that seeded areas should be rested at least two growing seasons or longer to prevent sagebrush seedlings from being trampled by livestock. Rested areas could provide Greater Sage-Grouse with new vegetation for cover habitat and forage without competition with livestock during the rest period. Not allowing treatments in known Greater Sage-Grouse winter habitat in the TBNG with the exception to strategically reduce wildland fire risk could protect important habitat components for Greater Sage-Grouse.

Reclamation of Greater Sage-Grouse habitat in accordance to the Wyoming Reclamation Policy (BLM 2009a) would provide restoration of habitat following oil, gas, and other surface disturbing activities. If the policy is followed, soil erosion and introduction of exotic or invasive plant species could be minimized. The landscape could be reclaimed to the original habitat components and structure to the extent possible. While the initial disturbance would result in habitat loss, some sagebrush habitat could be restored over the long term. Some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas.

Use of weed-free seed and mulch, desirable non-native species or sterile perennials, or reclaiming to native site plant composition for reclamation projects could reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Areas that restore with native plant composition provide habitat and cover for Greater Sage-Grouse and could support populations in the future.

Working with stakeholders to control grasshoppers and Mormon crickets in the Casper Field Office could impact Greater Sage-Grouse from the loss of an important food source for chick survival (Cagney et al. 2010). However; major infestations could result in vegetation loss from insect consumption of plants. Impacts to Greater Sage-Grouse from pesticide spraying can cause short-term displacement from vehicle use and human presence.

In the Rock Springs Field Office, management of wild horses to consider wildlife, watershed, and other resource needs could help preserve the herbaceous component of sagebrush habitat, if management focused on Greater Sage-Grouse needs (Cagney et al. 2010). Considering water developments to improve herd distribution and manage forage utilization only if wildlife habitat and resource conditions will be improved or maintained, could provide habitat improvements to sage-grouse.

Using wildfire for resource benefit can result in impacts from habitat loss, habitat fragmentation, displacement of sage-grouse to less desirable, lower quality habitat. Invasive, non-native plant species such as cheatgrass can become established in disturbed areas which can alter native plant composition, reducing forage and cover for Greater Sage-Grouse.

In Rock Springs, where prescribed burns are preferred in areas having greater than 35% sagebrush composition, 20% desirable grass composition, and greater than 10 inches of precipitation, any loss of sagebrush habitat could result in declines in Greater Sage-Grouse. Wildland fire use in Greater Sage-Grouse lek habitat has shown negative results from loss of leks. (Connelly et al. 2000). Use of fire within sagebrush habitat is not recommended due to the slow recovery of sagebrush and regeneration of the overall habitat (Cagney et al. 2010). Even if an area of sagebrush habitat were to recover, sage-grouse may not return. Rehabilitation for areas burned by wildland fires (Kemmerer, Newcastle and Rawlins) to prevent further resource damage could protect habitat from erosion and landslides that could result in additional habitat loss. Suppression techniques could impact Greater Sage-Grouse if they occur in sagebrush habitat, core or general Greater Sage-Grouse habitat. Vegetation removal, crushing of habitat, the use of heavy equipment and fire retardant and human presence could force Greater Sage-Grouse from the area where these activities occurred, possibly to less desirable, lower quality habitat which often leads to species decline.

Prioritizing Bates Hole and Fish Creek/Willow Creek for vegetative treatments to improve Greater Sage-Grouse habitats could be effective in controlling invasive annual plant species such as cheatgrass, but most research shows that a majority of treatment techniques are not helpful for providing habitat for Greater Sage-Grouse (Connelly et al. 2004, Crawford et al. 2004, Cagney et al. 2010). Imazapic chemical treatment could be effective in controlling invasive annual plant species such as cheatgrass; preventing Greater Sage-Grouse habitats from degradation. Using monitoring to ensure residual herbaceous vegetation is maintained for nesting cover in Greater Sage-Grouse habitat within these areas could help retain some effective habitat components in treatment areas.

Offsite mitigation in the Pinedale Field Office for oil and gas development could provide future habitat components for Greater Sage-Grouse if sagebrush habitat were being mitigated. The initial mitigation projects could displace sage-grouse from human and vehicle presence; habitat could be further fragmented, interrupting migration corridors, and causing Greater Sage-Grouse to temporarily or permanently abandon habitat.

For sage-grouse leks inside core habitat and connectivity habitat areas, avoiding surface disturbing activities or occupancy within 0.25 miles of occupied Greater Sage-Grouse leks in the Casper (except for Bates Hole and Fish Creek/Willow Creek), Kemmerer, Newcastle, Pinedale (in Traditional Leasing Areas and Unavailable Areas), Rawlins, and Rock Springs (including Jack Morrow Hills) Field Offices and TBNG would provide some area of protection to Greater Sage-Grouse from disturbance and habitat fragmentation. Sage-grouse leks within 0.25 miles of natural gas development were shown to have significantly fewer males per lek and lower annual rates of population growth compared to leks with less disturbance (Braun et al. 2002, Holloran 2005). Connelly et al. (2000) recommend that energy related facilities be located at least two miles from active leks in areas where sagebrush habitat components are uniform, and approximately three miles where habitat components are non-uniform (Holloran and Anderson 2005). Declines of Greater Sage-Grouse populations following energy development have been shown through numerous scientific studies (Braun 1986, Remington and Braun 1991, Braun et al. 2002, Holloran 2005, Walker et al. 2007, Hess and Beck 2012). While Alternative A provides a buffer area from surface disturbance or occupancy; it is not of a distance that is recommended by current science and may force Greater Sage-Grouse away from high quality leks to other areas of lower quality habitat and smaller populations of lekking birds. The result of lek disturbance and abandonment is lower reproductive rates of Greater Sage-Grouse, and reduction of Greater Sage-Grouse populations.

Management in the Bates Hole and Fish Creek/Willow Creek area of the Casper Field Office restricts or prohibits surface disturbing activity within 0.75 miles of occupied Greater Sage-Grouse leks. In areas with over 10% canopy cover, surface disturbing activities would be avoided within four miles of occupied Greater Sage-Grouse leks. The additional 0.5-mile distance from leks, as compared to the other areas under Alternative A, would allow for greater protection from surface disturbing activities, habitat loss, and reduction of contiguous lekking habitat areas. The four-mile buffer in areas with over 10% canopy cover would provide ideal habitat protection and connectivity, as well as allowing for minimal disturbance to Greater Sage-Grouse in leks. Birds in these protected areas are expected to remain/return to leks and continue reproductive activities to maintain or increase population numbers.

Providing buffers around leks for all Field Offices and Forest Service Units (except the BTNF and MBNF) under Alternative A would help reduce habitat fragmentation around leks (Table 4-106). Buffers around leks can provide undisturbed corridors for females to move from the lek to nesting areas. Areas of habitat connectivity are imperative for Greater Sage-Grouse survival. Walker et al. (2007) recommends large areas with extensive stands of sagebrush of approximately four or more miles around leks to allow breeding populations of Greater Sage-Grouse to return to the lek. The availability of large, uninterrupted areas of sagebrush habitat for Greater Sage-Grouse to forage and nest is likely to influence the size of the breeding populations and persistence of leks (Swenson et al. 1987, Ellis et al. 1989, Schroeder et al. 1999, Leonard et al. 2000, Smith et al. 2005).

In Greater Sage-Grouse core, general, and connectivity habitat, avoiding surface-disturbing and disruptive activities in suitable Greater Sage-Grouse nesting and early brood-rearing habitats within two miles of an occupied lek, or in identified Greater Sage-Grouse nesting and early brood-rearing habitat outside the two-mile buffer from March 15 to July 15 in Casper, Kemmerer, Newcastle, Pinedale (Traditional Leasing Areas and Unavailable Areas), and TBNG and MBNF from March 1 to June 15 would provide uninterrupted corridors for female Greater Sage-Grouse to migrate from leks to nesting areas (Table 4-107). Female Greater Sage-Grouse will avoid nesting in areas of development or where disturbing or land-clearing activities occur, such as oil and gas development, roads, urban areas, or cropland (Aldridge and Boyce 2007). Sage-grouse that nest within the two-mile buffer area would be protected from habitat loss and disturbance from noise and human presence within that buffer area. Suitable Greater Sage-Grouse habitat outside the defined spatial buffer would not receive any timing restrictions. Impacts to nesting Greater Sage-Grouse and other Special Status Species may occur on various levels. Direct take is possible if nesting was to occur within proposed disturbance areas. Depending on distance from the disturbance, increased stress, or decreased time on a nest, changes in behavioral patterns may occur. In the Rawlins Field Office, the restrictions are similar except that there are additional restrictions for geophysical surveys and organized recreational activities that require a SUP which would protect Greater Sage-Grouse from these additional disturbing activities. The Rawlins Field Office also starts their avoidance timing on March 1 to correspond with the seasonal activity of Greater Sage-Grouse in that area of Wyoming. Rock Springs, including Jack Morrow Hills, follows a similar protocol as the other field offices; however, their restrictions are on a case-by case basis.

Seasonal timing limitations for human activity in the Bates Hole and Fish Creek/Willow Creek areas of the Casper Field Office within 0.75 miles of occupied Greater Sage-Grouse leks during specified timeframes could reduce disturbance to lekking, nesting, or grouse chicks (Table 4-107). Surface development or disturbing activities would be restricted within four miles of occupied Greater Sage-Grouse leks. The additional buffer distances from leks would allow for greater protection from human activity and disruption of lekking activities. The four-mile buffer distance for surface disturbance or disturbing activities would provide additional protection from human activity and disruption of lekking activities as well as provide expansive habitat protection and habitat connectivity. The buffer distance also meets the recommendations from Walker et al. (2007) for a four-mile buffer distance around leks. Connelly et al. (2000) recommends that “human activities within view of or within 0.3 miles from leks should be minimized during the early

morning and late evening when birds are near or on leks." Timing limitations can be an important tool for species protection during critical life stages (i.e., egg incubation and parturition), if they are used in conjunction with the proper habitat management for that species. The timing limitation for Greater Sage-Grouse leks would offer reduction of disturbance from human activity to birds that remain in the buffer area and are active within the dates and times designated by the field offices.

Surface-disturbing and disruptive activities in Greater Sage-Grouse winter concentration areas would be avoided from November 15 to March 14 in the Casper, Kemmerer, and Newcastle Field Offices. In the Bates Hole and Fish Creek/Willow Creek area, surface disturbing activities that occur within sage-grouse winter habitat would be restricted in sagebrush stands of more than 20% canopy cover. For the Pinedale, Rawlins, and Rock Springs field offices, winter protections occur within winter concentration areas. In the Pinedale, Rawlins, and Rock Springs (Jack Morrow Hills area) field offices, the timing is also from November 15 to March 14. Within the remainder of the Rock Springs Field Office, restrictions are on a case-by-case basis. Winter habitat contains specific areas of sagebrush which rise 10-14 inches above the snow where Greater Sage-Grouse can feed on sagebrush leaves and buds (BLM 2009b). Winter concentration areas are documented areas where large numbers (25 to 50 or more) of Greater Sage-Grouse consistently use habitat during the winter months and contain sagebrush as described for winter habitat (BLM 2009b). The management would provide Greater Sage-Grouse within this habitat protection from noise, human disturbance, and habitat loss during the winter months. Winter habitat and concentration areas are another critical component of Greater Sage-Grouse habitat where birds come to feed solely on sagebrush. Doherty et al. (2008) reported that impacts to wintering habitat may have disproportionate effects on regional Greater Sage-Grouse population size and persistence due to the importance of sagebrush as their only food source in the winter.

Table 4-107. Seasonal Timing Limitations for Sage-Grouse Nesting and Early Brood-rearing Habitat

Location	Dates/Time	Habitat	Buffer Distance from Leks	Type of Activity
Casper	March 15—July 15	Occupied lek, nesting, early brood-rearing	2 mile	Surface-disturbing or disruptive activity
Casper	March 1—May 15 8 p.m.—8 a.m.	Occupied leks	0.25 miles	Surface-disturbance or occupancy. Human activity.
Casper— Bates Hole and Fish Creek/Willow Creek	March 1—May 15 8 p.m.—8 a.m.	Occupied leks	0.75 miles	Surface use
Casper— Bates Hole and Fish Creek/Willow Creek	March 15—July 15 8 p.m.—8 a.m.	Occupied leks	4 mile	Surface development or wildlife-disturbing activities
Kemmerer	March 15—July 15	Nesting and early brood rearing	2 miles	Surface-disturbing and disruptive activity
Newcastle	March 15—July 15	Nesting and early brood rearing	2 miles	Surface disturbing activity
Pinedale	March 15—July 15	Nesting and early brood rearing	2 miles	Surface-disturbing activity in Traditional Leasing Areas and Unavailable Areas

Location	Dates/Time	Habitat	Buffer Distance from Leks	Type of Activity
Rawlins	March 1—July 15	Nesting and early brood rearing	2 miles	Surface-disturbing and disruptive activity
Rock Springs	March 1—July 15	Nesting	Appropriate distances up to 2 miles	—
Rock Springs—Jack Morrow Hills	March 15—July 15	Nesting and early brood rearing	Case-by-case	Disruptive activities
BTNF	—	—	—	Case-by-case
MBNF	March 1—June 30	—	2 mile	New, various disturbances
TBNG	March 1—June 15	Nesting	2 mile	Specific surface disturbing activities.

Minimizing impacts from predators, such as minimizing creation of new roads and requiring raptor perch deterrents on power poles as a component of permit issuance or renewal, could affect Greater Sage-Grouse by reducing predation to the species.

Noise minimization could reduce disturbance to wildlife species (Kemmerer, Pinedale, and TBNG). Specific limitations such as limiting noise to 49 decibels (10 dBA above background noise) from March 1 to June 15 or within two miles of a Greater Sage-Grouse lek (TBNG) could reduce disturbance to Greater Sage-Grouse. Studies conducted on Greater Sage-Grouse indicate that noise could adversely affect the communication abilities of strutting males (LaGory et al. 2001; Dantzker et al. 1999). Holloran (2005) and Blickley et al. (2012) suggest that noise emitted from drilling operations could reduce lek attendance by male and possibly female sage-grouse. Reducing noise could allow for males to continue use of leks nearby drilling operations.

4.14.4 Alternative B

The following impacts apply to Alternatives B, C, and D and the Proposed LUP Amendments:

Implementing direct mitigation, utilizing BMPs, and offsite compensatory mitigation would help maintain or improve sagebrush habitat and would minimize vegetation loss and soil erosion which could maintain or improve water quality, protecting important special status fish habitat. Utilizing Local Working Group (LWG) plans, analyses, and other sources of information to guide development of conservation objectives for local management of Greater Sage-Grouse habitats provides additional data and resources to aid in the protection and management of sagebrush habitat. These measures could protect or enhance sagebrush habitat where projects occur outside of BLM-administered lands and National Forest System lands, providing additional areas of habitat connectivity. This management would support special status wildlife species that use sagebrush habitat within and outside the planning area.

Application of appropriate seasonal restrictions when implementing vegetation management treatments for seasonal habitats in Greater Sage-Grouse priority habitat could provide special status wildlife with habitat improvements and could reduce the disturbance of wildlife that use habitat during the same season as Greater Sage-Grouse, such as Sage Thrasher, pygmy rabbit, and Brewer's Sparrow. Monitoring the treatments could provide feedback to whether the treatments were successful and if changes should be made in the approach to methods or timing in the area.

Ensuring site-specific, measurable, conservation, and mitigation objectives are included in project planning within Greater Sage-Grouse priority habitats could help Special Status Species habitat recover after projects were completed and could assist in maintaining habitat and minimizing disturbance of special status wildlife during project development.

Developing landscape-scale restoration/conservation and maintenance strategies, including special management of seasonal habitats and connectivity zones outside of Greater Sage-Grouse core/priority habitat areas, with voluntary partners and cooperating agencies could protect uninterrupted expanses of sagebrush habitat, providing special status wildlife species with fewer disruptions of habitat. Improvements made to habitat would benefit special status wildlife with improved forage and cover.

Using Integrated Vegetation Management per BLM Handbook H-1740-2 and Forest Service Manual 2080 and designing all range projects to minimize potential for invasive species establishment could help prevent the spread and inundation of invasive, non-native plant species. Invasive, non-native plant species can proliferate in disturbed areas and permanently damage native ecosystems if not prevented or quickly eradicated. Most special status wildlife species rely on native plant species for food and cover; when invasive, non-native plant species replace native habitat, species must relocate in search of desired habitat. If special status wildlife must travel any distance to relocate, their systems can become stressed, and if large numbers of wildlife are forced to leave an area due to lack of forage or cover, the relocation area may not be able to support all of the relocating species and they could be impacted by lack of forage or habitat. Monitoring and treating invasive species associated with existing range improvements could also prevent the establishment and spread of invasive, non-native plant species.

Applying RDFs (Appendix B) as mandatory stipulations/COAs within core/priority and connectivity sage-grouse habitat for fluid minerals, travel management, lands and realty, range management, wild horses, locatable minerals, West Nile virus, mineral materials, non-energy solid leasables, vegetation management, fire and fuels management, and noise where applicable, appropriate, and technically feasible, could ensure uninterrupted expanses of sagebrush habitat, providing Special Status Species with fewer disruptions of habitat, improved forage and cover within Greater Sage-Grouse core/priority habitat areas.

Sagebrush habitat could be protected or improved where operators agree to implement additional conservation measures for their approved leases within Greater Sage-Grouse core/priority habitat. The degree and scale depends on which measures are implemented.

Incorporating new occupied sage-grouse habitat into Greater Sage-Grouse core/priority areas for management as they are found would provide special management and protection to the Special Status Species found within these areas. Continued ground-truth efforts for statewide Greater Sage-Grouse models could contribute data to provide more accuracy for the modeling effort. Using the sage-grouse Habitat Assessment Framework or best available assessment tool for evaluating Greater Sage-Grouse habitats would allow BLM or Forest Service wildlife biologists to survey for habitat value with the greatest accuracy and would provide rich data to support conservation, protection, and improvement of these habitats. Annual meetings and reviews of lek data with WGFD could provide continued communication and data transfer between agencies.

Working with proponents holding valid existing leases to provide additional protections to sagebrush habitat could reduce habitat loss and disturbance to sagebrush dependent Special Status Species and could allow for contiguous, uninterrupted habitat. It is unknown, however, what level of long-term protection of habitat would occur, because the outcome is at each leaseholder's discretion. If leaseholders/project proponents agree to additional protections for their lease, there would be a reduction in additional habitat loss and fragmentation due to oil and gas development by protecting existing habitat resources from new development with buffer distances, additional reclamation, or seasonal closures. This would occur for all

projects both inside and outside Greater Sage-Grouse core/priority and connectivity habitat, which would allow for greater protections as habitat outside Greater Sage-Grouse core/priority and connectivity habitat would be included.

Limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative A.

Completing activity level travel plans within five years of the ROD would provide each BLM field office the opportunity to address and analyze transportation routes that fragment Greater Sage-Grouse or other sensitive habitat. Designating routes during activity level planning in core/priority and connectivity habitats with current administrative/agency purpose or need to administrative access only could reduce the level of road/route use. Reducing road/route use could decrease the level of disturbance from vehicle and human presence, or collisions with vehicles for wildlife. Assessing existing plans for consistency with Greater Sage-Grouse conservation objectives could allow the BLM and Forest Service to make changes to routes/roads that could reduce further impacts to Special Status Species and their habitat.

The construction of roads to minimum design standards needed for production activities within Greater Sage-Grouse core/priority and connectivity habitats, in compliance with the DDCT, could reduce the amount of disturbance from road construction in some cases. Road construction can cause habitat and vegetation loss, erosion, sedimentation, and runoff which can affect special status plants and aquatic species. The spread of invasive, non-native plant species may also occur during or following road construction, which can further damage habitat. Human presence and vehicles may force special status wildlife species away from desired habitat to lower quality, less desirable habitat, creating additional stress for special status wildlife.

Working with project proponents in siting projects in locations containing the least sensitive habitats to minimize impacts to sensitive resources could reduce loss of higher quality habitat for Special Status Species that use or inhabit these areas and may allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects species from human and other disturbance. Disturbance can result in wildlife moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a decline in special status wildlife populations.

The following impacts apply only to Alternative B:

Under Alternative B, new transmission corridors would not be authorized within Greater Sage-Grouse priority and connectivity areas which would prevent habitat loss from linear corridors within the area. Prohibiting new above-ground structures would also prevent new habitat loss, disturbance, or life-cycle disruption; all of which would protect Special Status Species and their habitat within sage-grouse priority habitat areas. Maintenance and upgrades of existing structures could result in short-term disturbance of special status wildlife from human and vehicle activity, but long-term impacts could be minimal. Linear disturbances can create barriers in migration corridors and fragmentation of habitat for Special Status Species. Disturbed corridors are desirable areas for predatory special status animals, preventing the development of these areas may be beneficial to special status prey species but would also reduce hunting corridors for the predators. Preventing overhead structures in these areas could reduce the risk of predation from overhead predators, but also prevent the construction of overhead perches for predator hunting. The risk of collision or electrocution of special status bird and bat species could be reduced where overhead structures are not allowed. Maintenance and upgrades of existing structures could result in short-term disturbance of Special Status Species from human and vehicle activity, but long-term impacts would be minimal.

In priority Greater Sage-Grouse habitat, relocating existing designated ROW corridors void of authorized ROWs or undesignating the corridor could prevent future disturbance to Special Status Species and their habitat from the construction of transmission lines or other linear ROW, as described above.

Under Alternative B, 5,271,140 acres would be managed as exclusion areas for new ROW/SUA permits, which could protect 4,985,510 more acres than in Alternative A. Avoidance areas would encompass 6,357,180 acres, 3,896,840 more acres than Alternative A. Impacts to Special Status Species habitat in these areas would be the same as Alternative A, although greater areas would be managed as exclusion and avoidance areas as compared to Alternative A. Co-locating ROWs or SUAs could reduce overall disturbance to new habitat; however, disturbance would still occur during development within the existing corridor. Special status species that use early successional habitat could be impacted by development within existing corridor. Construction could result in vegetation loss and erosion which could affect special status plants from removal and could affect special status aquatic species from sedimentation and diminished water quality. The spread of invasive, non-native plant species may also occur during or following construction which could compete with special status plant species. Human presence and vehicles may force Special Status Species away from desired habitat to lower quality, less desirable habitat. Collisions of Special Status Species with vehicles may also occur during construction. Corridors are desirable areas for predatory animals, but these areas may be avoided by prey species which may move to less desirable habitat to avoid predation. A 3% disturbance cap could further prevent habitat loss and disturbance to Greater Sage-Grouse. Mitigation to offset exceeding the 3% cap could provide habitat for Special Status Species, but revegetation of effective sagebrush habitat can take 10 or more years, depending on soil conditions, climate and weather, viability of seed and/or transplants, and ongoing maintenance to prevent invasive, non-native plant species from taking over the area.

Removing, modifying, or burying existing power lines, reclaiming linear features such as roads or fences, or removal of facilities, and reclamation of well sites could provide benefits to special status wildlife species. Removing, modifying, or burying existing power lines could reduce the risk of collision or electrocution of special status bats, raptors, and other avian species. Prey species would be less likely to be subject to hunting from predatory bird species; however, predatory birds would no longer benefit from overhead hunting perches. Removal of fences reduces threats of injury or death from impacts to fences, opens up travel corridors, and could allow access to additional forage and cover. There would be short-term disturbance during reclamation and some initial habitat loss before vegetation returns. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. During reclamation, human and vehicle presence could cause species to vacate the area to lower quality habitat. Moving from desirable habitat can result in reduced health of animals, making them susceptible to disease or predation.

Under Alternative B, wind development in Greater Sage-Grouse priority habitat would be excluded. In Greater Sage-Grouse general habitat, 127 turbines are projected to be developed, 1,127 fewer than under Alternative A. The development of wind energy outside of sage-grouse priority habitat areas could cause habitat loss, and both short and long-term impacts to Special Status Species habitat. Impacts from wind development in Greater Sage-Grouse general habitat would be the same as described under Alternative A, but for a fewer number of turbines.

Restrictions on MET towers in Greater Sage-Grouse priority habitat could prevent impacts to smaller wildlife species by preventing the perching of raptors and removing collision obstacles for avian and bat species within sagebrush habitat to a greater degree than in Alternative A.

Retaining public ownership of Greater Sage-Grouse priority habitat would ensure that management within these areas would protect sagebrush habitat with all of the BMPs and other designations, which could provide habitat protection and contiguous habitat for special status wildlife which inhabit these areas, and

would provide greater protections than Alternative A. Mitigation measures for land disposals with similar protections could provide habitat protection for sagebrush obligate Special Status Species. Acquisitions or conservation easements (in lieu of acquisitions) could allow for additional management for Greater Sage-Grouse, providing habitat protection for sagebrush obligate species. Seeking to acquire state and private lands with intact subsurface mineral estate or BLM-administered lands or National Forest System lands that need subsurface mineral estate by donation, purchase, or exchange could allow for additional management for Greater Sage-Grouse, providing habitat protection for sagebrush obligate species such as Brewer's Sparrow, Sage Thrasher, or pygmy rabbit.

Not recommending withdrawal proposals not associated with mineral activity in Greater Sage-Grouse priority habitat unless the land management is consistent with sage-grouse conservation measures could allow for additional management for Greater Sage-Grouse, providing habitat protection for sagebrush obligate species or other Special Status Species such as Sage Sparrow, Burrowing Owl, and midget faded rattlesnake.

Incorporating a light grazing strategy utilizing 20-30% forage allocation for livestock in allotments not meeting standards in Greater Sage-Grouse priority habitat could provide an opportunity for forbs, grasses, and sagebrush to restore for forage and cover for Special Status Species within sage-grouse priority habitat areas.

Working cooperatively on integrated ranch planning within Greater Sage-Grouse habitat (in Greater Sage-Grouse priority habitat) could allow for coordinated planning between ranchers and federal agencies by planning in single units, and could lead to fewer disturbances to Special Status Species.

Impacts would be the same as Alternative A for management of rangelands, vegetation, and livestock grazing. In addition, Alternative B would require more stringent management from assessments to include indicators and measurements of structure, condition, and composition of vegetation specific to achieving sage-grouse habitat objectives, or by using sage-grouse habitat recommendations from Connelly et al. 2000b and Hagen et al. 2007, prioritizing completion of land health assessments, and using Ecological Site Descriptions (ESD). This management could allow for more frequent feedback on habitat conditions where livestock grazing and Greater Sage-Grouse habitat overlaps. Monitoring could provide information as to where objectives are not being met and could lead to effective procedures to take proper steps to ensure that those areas can meet habitat objectives, and provide adequate cover and forage for Special Status Species.

In the Pinedale Field Office, reducing livestock grazing to 20-30% of the permitted use in allotments in sage-grouse priority habitats that have failed the land health standards due to livestock grazing could provide for more rapid recovery of nesting and brood rearing habitats in these areas. However, literature suggests that the timing of livestock use is more important than the amount of use in maintaining or promoting the health of important mid-stature native perennial bunchgrasses such as bluebunch wheatgrass, king spike fescue, Indian ricegrass, and needle and thread. Because the sagebrush steppe grasslands of the Intermountain West did not evolve with continuous livestock grazing (Davies et al. 2014, Faith and Surovell 2009, Knight 1994, Laycock 1991, Mack and Thompson 1982, Milton et al. 1994), the mid-stature bunchgrasses that are key to the health of these sites are less resistant to livestock grazing (Mack and Thompson 1982, Milton et al. 1994, Sheley and Svejcar 2009, Westenskow-Wall et al. 1994). The bunchgrasses are particularly sensitive to herbivory during the active growth period (Cagney et al. 2010, Anderson 1991, Blaisdell and Pechanec 1949, Burkhardt and Sanders 2010, Pyke 2011, Westenskow-Wall et al. 1994); this period typically occurs from early May to mid-June in Wyoming (Cagney et al. 2010).

The mid-stature bunchgrasses are dependent on reproduction by seed to maintain their presence on the landscape (Milton et al. 1994, Painter 1996, Pyke 2011, Anderson 1991). When these plants are grazed during the active growing season, production of flowers and seeds is severely reduced or even eliminated

(Anderson 1991, Blaisdell and Pechanec 1949, Burkhardt and Sanders 2010, Heady 1950, Mack and Thompson 1982, Milton et al. 1994, Mueggler 1975, Painter 1996, Pyke 2011). For this reason, researchers recommend that these sagebrush sites in the Intermountain West be grazed during the growing season (May-June) at most in every other year (Burkhardt and Sanders 2010), but preferably grazing during this season should be limited to 1 year out of every 3 (Cagney et al. 2010, Burkhardt and Sanders 2010), or be conducted during dormant seasons rather than the active growing season (Pyke 2011, Davies et al. 2014). Even in areas where rhizomatous grasses and bluegrasses predominate, the need for management to provide growing season rest and limited utilization of preferred bunchgrass species is emphasized (Cagney et al. 2010).

Reducing the procedures to retire grazing allotments could allow habitat to recover from the use of livestock, which could provide additional habitat and forage for Special Status Species.

Impacts to Special Status Species from conservation plan development to modify grazing management to meet seasonal Greater Sage-Grouse habitat requirements in Greater Sage-Grouse priority habitat would be the same as Alternative A. In addition, including terms and conditions on grazing permits and leases that assure plant growth requirement are met, and residual forage remains available for sage-grouse hiding cover could provide Special Status Species additional habitat components of forage or cover.

Impacts to special status plants and wildlife habitat from the retirement of grazing privileges would be the same as Alternative A, but could be applied a larger area within Greater Sage-Grouse priority habitat. Identifying specific allotment(s) where permanent retirement of grazing privileges is potentially beneficial to Greater Sage-Grouse could provide Special Status Species with larger areas of contiguous, uninterrupted habitat with desirable habitat components such as adequate forage and cover species. Special status plant species could be protected from vegetation loss or damage, erosion, and soil loss from removal of livestock.

Impacts to special status plants and wildlife habitat from management for drought and other conditions in livestock allotments would be the same as Alternative A, but would apply to all Greater Sage-Grouse priority habitat. Additional priority for Greater Sage-Grouse habitat during periods of drought could also be beneficial to Special Status Species which also use sagebrush habitat for forage of cover.

Impacts to special status plants and wildlife habitat from range improvement projects would be the same as Alternative A. In addition, designing any new structural range improvements and location of supplements (salt or protein blocks) to conserve, enhance, or restore Greater Sage-Grouse habitat through an improved grazing management system relative to sage-grouse objectives and other considerations for range improvements within Greater Sage-Grouse priority habitat could also be beneficial to Special Status Species which use sagebrush habitat for forage or cover. Requiring sage-grouse safe fence design could reduce impacts to special status avian species from collisions. Perch inhibitors for raptors could prevent prey species from hunting from predatory bird species; however, predatory birds would not benefit from overhead hunting perches.

Impacts to special status plants, wildlife and fisheries habitat from management of riparian, springs, and seep areas would be the same as Alternative A. Additional management to reduce hot season grazing and for edge habitat in wet meadows could provide Special Status Species with improved habitat conditions during hot weather within riparian areas.

Impacts to Greater Sage-Grouse from water development would be the same as Alternative A; however, implementing development in springs and seeps only where it would either benefit or have neutral impacts to Greater Sage-Grouse could also provide additional protection of Special Status Species habitat.

Not allowing any exceptions to lease stipulations, COAs, and T&Cs could prevent additional surface disturbing activities in Greater Sage-Grouse habitat, which temporarily reduces disturbance from roads, structures, power lines, and human activity and could allow for contiguous, uninterrupted habitat for that season the activity is proposed. Contiguous, uninterrupted habitat supports migration corridors, provides forage or hunting areas (in the case of predators), and can also protect Special Status Species from human and other disturbance. These are temporary benefits since the activity is only restricted seasonally.

Closing Greater Sage-Grouse priority habitat areas to fluid mineral leasing, 6,886,890 acres, would reduce habitat loss for Special Status Species and would allow for contiguous, uninterrupted habitat, and would close 6,015,110more acres than Alternative A. Contiguous, uninterrupted habitat protects special status wildlife from human and other disturbance and is necessary for wildlife to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force Special Status Species to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity. Allowing exceptions to the closure in areas where sage-grouse are shown to not be impacted could have impacts to Special Status Species as described under Alternative A. Under Alternative B, 2,117,160 acres would be managed as NSO, 2,076,180 more acres than Alternative A.

Oil, gas, and CBNG leasing and development would still be available outside of Greater Sage-Grouse priority habitat. Impacts from exploration and development activities would be the same as described under Alternative A for oil and gas development; however, 13,709 wells are predicted to be developed outside of sage-grouse priority habitat under Alternative B, 2,702 fewer wells as compared to Alternative A. Under Alternative B, only 33,530 acres of short-term disturbance would occur, 5,520 fewer acres than Alternative A; and 104,050 acres of long-term disturbance would remain under Alternative B, 26,280 fewer acres than Alternative A. The lower number of acres disturbed by oil and gas development would provide even greater protections to Special Status Species as compared to Alternative A.

Impacts from geophysical exploration to Greater Sage-Grouse would be the same as Alternative A. Some impacts could be reduced by using helicopter-portable drilling or wheeled or tracked vehicles on existing roads in accordance with seasonal timing limitations and other restrictions that may apply. Using helicopters or existing roads for geophysical exploration could reduce linear disturbances to vegetation created by vibroseis thereby preventing impacts to Special Status Species habitat from vegetation damage or loss and interruption of habitat and migration corridors.

Impacts to Greater Sage-Grouse from offsite mitigation would be the same as Alternative A. In addition, applying COAs, mitigating or reducing the impact to Greater Sage-Grouse priority habitat during lease development would reduce habitat loss for Special Status Species and would allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects special status wildlife from human and other disturbance and is necessary for wildlife to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species, which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors to special status wildlife and disruption of habitat and would allow for continued habitat connectivity in areas where future leases could occur under the other action alternatives.

Working with proponents holding valid existing leases to promote measurable Greater Sage-Grouse conservation objectives within priority habitat could reduce habitat loss and disturbance to sagebrush dependent wildlife species and could allow for contiguous, uninterrupted habitat. It is unknown, however, what level of long-term protection of habitat would occur because the outcome is at each leaseholder's discretion. If leaseholders/project proponents agree to additional protections for their lease, there would be a reduction in additional habitat loss and fragmentation due to oil and gas development by protecting existing habitat resources from new development with buffer distances, additional reclamation, or seasonal closures. This would occur for all projects both inside and outside Greater Sage-Grouse priority habitat, which would allow for greater protections, as land outside Greater Sage-Grouse priority habitat would be included.

Working with project proponents in siting projects to promote measurable Greater Sage-Grouse conservation objectives would impact Special Status Species the same as Alternative A. In addition, requiring development within priority habitat to be placed in the area least harmful to Greater Sage-Grouse based on vegetation, topography, or other habitat features could benefit wildlife species that use Greater Sage-Grouse habitat, such as pygmy rabbit and Sage Sparrow.

Not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat (2,082,140 acres) could reduce habitat loss for Special Status Species and would allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects special status wildlife from human and other disturbance and is necessary for wildlife to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force Special Status Species to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A. While a four-mile buffer around a lek could reduce or prevent impacts to Special Status Species from disturbance from noise, human and vehicle presence, and drilling activities in the buffer area, habitat could be still impacted from oil and gas development by surface disturbance, habitat loss, erosion, and the spread of invasive, non-native plant species. Surface disturbance also disrupts contiguous habitat, which can inhibit special status wildlife travel and migration patterns, and could lead to reduced health and reproductive success in some special status wildlife species within sage-grouse priority habitat.

Completing Master Development Plans during planning and review of projects involving multiple proposed disturbances within a lease or priority habitat area, without an exception for individual wildcat (exploratory) wells could provide fewer impacts to special status from surface disturbance from consolidated planning of infrastructure within the development area.

Requiring unitization within Greater Sage-Grouse priority habitat when deemed necessary for proper development and operation of an area (with strong oversight and monitoring) could consolidate development and infrastructure, reducing impacts to Special Status Species and their habitat from surface disturbing activities (Marranzino et al. 2011).

Requiring full reclamation bonds sufficient to restore lands to prior disturbance conditions (Connelly et al. 2000, Hagen et al. 2007) could provide Special Status Species with complete habitat improvement and recovery in areas disturbed by oil, gas and other surface disturbing activities if project abandonment occurs. Full restoration of habitat could benefit Special Status Species with native forage and cover depending on the habitat being restored.

Impacts to Special Status Species from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative A, but on a larger scale for the entire planning area.

Under Alternative B, 6,992,690 acres would be closed to non-energy, solid mineral leasing. Impacts to Special Status Species from coal leasing in lands outside of priority Greater Sage-Grouse habitat would be the same as Alternative A. In addition, finding Greater Sage-Grouse priority habitat unsuitable to all surface mining of coal under the criteria set forth in 43 CFR 3461.5 would prevent surface disturbance, habitat loss or damage, soil runoff, erosion, and the introduction or spread of invasive, non-native plant species. Impacts such as displacement of Special Status Species from surface mining activities, avoidance of the area around the development because of human and vehicle presence and noise forcing Special Status Species to move from high quality habitat to areas of lower quality, less desirable habitat could be avoided if surface mining for coal was found unsuitable.

Granting no new underground mining leases unless all surface disturbances (appurtenant facilities) are placed outside of the Greater Sage-Grouse priority habitat area would reduce surface disturbance within Greater Sage-Grouse priority habitat, creating a smaller amount of forage and habitat loss compared to Alternative A. Human presence and vehicle use to access the mine could cause displacement of Special Status Species from vehicles and noise, avoidance of a larger area around the development because of human presence, vehicles and noise, and possible collisions from vehicles. Vehicle routes are prone to use by predators, which would benefit predators but could impact prey species (prairie dog, Wyoming pocket gopher, and pygmy rabbit) from predation.

Allowing appurtenant facilities by co-locating them or building facilities to minimum standards could result in surface disturbance or habitat loss, soil loss or sedimentation, and the introduction or spread of invasive, non-native plant species. The management could reduce overall disturbance to new habitat; however, disturbance could occur within an existing corridor. Special status species that use early successional habitat such as mountain plover, long-billed curlew or white-tailed prairie dog could be impacted by development within an existing corridor. Noise, human presence, vehicle use, and linear disturbances can cause Special Status Species to move to habitat lower quality, less desirable forage and cover during and following construction activities.

Not allowing coal exploration in Greater Sage-Grouse priority habitat would prevent the impacts described under Alternative A.

Closing Greater Sage-Grouse priority habitat to non-energy leasable mineral leasing (6,992,690 acres) would prevent the impacts described under Alternative A.

If all lands recommended for withdrawal from mineral entry within Greater Sage-Grouse priority habitat were withdrawn (5,118,070 acres), 5,044,800 more acres of Special Status Species habitat could be protected from disturbance and habitat loss as compared to Alternative A. Additional mitigation, seasonal restrictions, or making withdrawal areas subject to validity exams or buy out could reduce further habitat disturbance or damage, or in some cases, improvement in habitat.

Under Alternative B, 6,992,690 acres would be closed to mineral material sales, exploration, and free use permits, 6,519,890 more acres as compared to Alternative A. Special Status Species and their habitat within these areas would not be impacted by displacement from exploration or pit areas, abandoning habitat within the area around the development because of human presence and noise, and possible offsite impacts, including erosion, and spread of invasive, non-native plant species.

Restoring salable mineral pits within Greater Sage-Grouse priority habitat could cause short-term impacts to Special Status Species and their habitat from restoration activities by human and vehicle presence, noise, or surface disturbance and runoff; however, restoring habitat for wildlife could have long-term beneficial impacts from additional forage and cover, especially for Special Status Species that use sagebrush habitat.

Allowing BLM SRPs and Forest Service RSUAs in Greater Sage-Grouse priority habitat that have neutral or beneficial effects to priority habitat areas could reduce the impacts to Special Status Species from recreational activities and human presence as compared to Alternative A.

Greater Sage-Grouse priority habitat areas would be designated as Greater Sage-Grouse conservation ACECs/SIA, 5,025,550 acres. Special Status Species plants, wildlife and fisheries habitat could receive the benefits of management under an ACEC/SIA. This management would be focused on the protection of Greater Sage-Grouse habitat, which would also benefit Special Status Species, especially those that use sagebrush and associated habitat.

Designating all OHV "open" areas within Greater Sage-Grouse priority habitat areas as limited to designated roads and trails (not including the sand dune portions of these areas) (Poison Spider OHV Park [285 acres]; Dune Pond Cooperative Management Area [3,736 acres]; and the portion of the Greater Sand Dunes Recreation Area [529 acres]) could prevent damage to Special Status Species habitat from off road vehicle use. Off road, open OHV use in areas outside of the dunes can degrade vegetation and lead to erosion and habitat loss, reduced quality of habitat, and the introduction and spread of invasive, non-native plants that can further degrade habitat quality and change habitat composition. Designating use as limited to roads and trails could reduce these impacts to Special Status Species habitat. The remaining open areas are sand dunes, which are not desired habitat for most Special Status Species. However, two dune dwelling plants, blowout penstemon and dune wildrye, could be vulnerable to destruction or damage from vehicles if they occurred within the open OHV areas. Because these are existing OHV use areas, it is likely that most special status wildlife species have already abandoned use of the area.

Limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative A. Completing activity level travel plans within five years of the ROD would provide each BLM and Forest Service office the opportunity to address and analyze transportation routes that fragment Greater Sage-Grouse or other sensitive habitat. Designating routes during activity level planning in priority habitat with current administrative/agency purpose or need to administrative access only could reduce the level of road/route use. Reducing road/route use could decrease the level of disturbance to Greater Sage-Grouse leks or sensitive habitat from vehicle and human presence, collisions with vehicles, increased predation, or the spread of invasive, non-native plant species. Assessing existing plans for consistency with Greater Sage-Grouse conservation objectives could allow the BLM and Forest Service to make changes to routes/roads that could reduce further impacts to wildlife and wildlife habitat.

Not upgrading existing routes could reduce surface disturbance from upgrading activities, preventing vegetation and soil loss, sedimentation, and possible displacement of Special Status Species wildlife from human and vehicle presence. Any exceptions resulting in road upgrades could further fragment habitat, cause vegetation loss, erosion, and the spread of invasive, non-native plant species, which could affect special status plants. Human presence and vehicles may force Special Status Species wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat.

Using existing roads to access valid existing rights could prevent vegetation and soil loss, sedimentation, noise, vehicle use, and human presence that are associated with road construction. New road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road

construction which could affect special status plant and animal species. Human presence and vehicles may force special status wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals, but these areas may be avoided by prey species which may move to less desirable habitat to avoid predation. All of these impacts could be avoided by using existing roads. Increased use of roads during lease development could occur which could increase impacts to wildlife from collisions with vehicles. If new roads were necessary, impacts to Special Status Species and habitat described above could apply. Mitigation to offset exceeding the 3% cap could provide new habitat (where possible) to replace habitat that was lost during construction, but impacts from roads and construction would still affect Special Status Species, and new habitat would take at least five or more years to revegetate and 15-30 years to be fully restored (BLM 2004i).

Restoring roads or trails not designated in travel management plans within Greater Sage-Grouse priority habitat could provide fewer disturbances from occasional vehicle or human presence and could improve sagebrush habitat conditions by removing linear disturbances, allowing for greater habitat connectivity, and providing additional vegetation resources for Special Status Species forage or cover. Vehicle routes are prone to use by special status predators (swift fox, ferruginous hawk). Special status prey species (prairie dog, Wyoming pocket gopher, and pygmy rabbit) could benefit from the rehabilitation of unused roads or trails, which could reduce the presence of predatory animals; although special status predatory wildlife species could lose hunting habitat as roads and routes are reclaimed.

Special Status Species could benefit from managing for vegetation composition and structure consistent with ecological site potential and within the reference state to achieve Greater Sage-Grouse seasonal habitat objectives within Greater Sage-Grouse priority habitat. This management could provide sagebrush-obligate special status wildlife habitat, forage, and cover within these areas within 15 to 25 years for sagebrush, but much shorter term for forbs and grasses. Initial treatments could cause short-term impacts from displacement from human and vehicle activities which could move animals into less desirable habitat and could increase competition for available resources with other species and uses. Using ESD potential in Greater Sage-Grouse habitat to help protect against invasive, non-native plants could prevent the introduction and spread of invasive, non-native plant species which can alter or degrade the native landscape and force Special Status Species to move from high quality habitat to areas of lower quality, less desirable habitat.

Managing for vegetation composition and structure consistent with ecological site potential and within the reference state to achieve Greater Sage-Grouse seasonal habitat objectives within Greater Sage-Grouse priority habitat could provide Greater Sage-Grouse habitat, forage, and cover within these areas within 15 to 25 years for sagebrush, but much shorter term for forbs and grasses. Initial treatments could cause short-term impacts from displacement from human and vehicle activities which could cause Greater Sage-Grouse to move into less desirable habitat and could increase competition for available resources with other species and uses. Using ESD potential in Greater Sage-Grouse habitat to help protect against invasive, non-native plants could prevent the introduction and spread of invasive, non-native plant species which can alter or degrade the native landscape and cause Greater Sage-Grouse to move from high quality habitat to areas of lower quality, less desirable habitat. Special status plant species could be protected from vegetation loss or damage, erosion and soil loss, and the introduction and spread of invasive, non-native plant species.

Designing and limiting treatments within sagebrush habitat not to reduce sagebrush canopy cover to less than 15% could prevent habitat fragmentation and habitat loss within the greater habitat area, the same as Alternative A. Limiting prescribed burns to specific canopy cover, vegetation composition, patch size, or amount of precipitation within sagebrush habitat could cause vegetation treatments to be limited for the conditions and habitat structure. Special status plants and wildlife could benefit from carefully managed prescribed burn treatments as described above. Fuel breaks can provide barriers to wildland fires or contain

prescribed fire. While fuel breaks remove vegetation and habitat, and create linear disturbances, without them, catastrophic fires could occur, destroying habitat and leaving areas of disturbance. Considering the use of fuel breaks in NEPA documents could allow decision-makers to make an informed decision on the best course of action for each location.

In Greater Sage-Grouse priority habitat, allowing treatments that conserve, enhance, or restore Greater Sage-Grouse habitat could provide sagebrush obligate Special Status Species habitat, forage, and cover within these areas. Initial treatments could cause displacement from human and vehicle activities, which could move animals into less desirable habitat and could increase competition for available resources with other species and uses.

Not allowing treatments in known Greater Sage-Grouse winter range, with the exception to strategically reduce wildland fire risk, could protect habitat components to sagebrush obligate species, especially those who use winter habitat such as pygmy rabbit. Impacts to Special Status Species from resting treated areas from livestock grazing for two years after prescribed burns would be the same as Alternative A, although it would apply to the entire planning area. Impacts to Special Status Species from reclamation of Greater Sage-Grouse habitat, in accordance to the Wyoming Reclamation Policy (2009a), would be the same as Alternative A. Alternative B would prioritize fire operations in priority and general sage-grouse habitat immediately after life and property; therefore, the potential for disturbance to special status wildlife species within these habitats is lower under Alternative B than Alternative A. The greatest amount of benefit under Alternative B would be provided to those species whose ranges overlap priority habitat. There is potential to negatively influence those Special Status Species that use other habitat types.

Where restoration of Greater Sage-Grouse priority habitat occurs, the use of native seeds or other non-native seeds to meet Greater Sage-Grouse habitat objectives, reestablishment of sagebrush cover and desirable understory plants, restoring native plants and creating landscape patterns that most benefit Greater Sage-Grouse, considering potential changes in climate would provide habitat and forage for sagebrush obligate and other Special Status Species. Attempting to use native seeds not only provides Special Status Species with desirable forage and cover, it also can prevent the introduction and spread of invasive, non-native plant species which can alter habitat and render it unusable to Special Status Species. While the initial disturbance would result in habitat loss, over the long term, sagebrush habitat could be restored, although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Prioritizing areas for restoration could benefit Special Status Species that use those areas which are restored.

Prioritizing native seed allocation for use in Greater Sage-Grouse priority habitat in years when preferred native seed is in short supply by reallocating from ES&R (BLM) and/or BAER (Forest Service) projects could reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Special status plant species could be protected from vegetation loss or damage, erosion and soil loss, and the introduction and spread of invasive, non-native plant species. Areas that restore with native plant composition provide habitat and cover for Special Status Species and can support healthy wildlife populations. Managing post ES&R and BAER areas to ensure long-term persistence of seeded or pre-burn native plants, using temporary or long-term changes in livestock grazing, wild horse, and travel management, etc., could allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding pressure from grazing or other activities. Changing management in restored areas could provide special status wildlife with new vegetation for forage without competition or disturbance from other resource uses.

Altering existing seedings where appropriate, to benefit Greater Sage-Grouse, could also benefit sagebrush obligate Special Status Species such as pygmy rabbit, sage thrasher, and sage sparrow, but could impact

other Special Status Species that are using the existing seedings from habitat loss. Short-term impacts to special status wildlife and wildlife habitat could occur from restoration activities by human and vehicle presence, noise, or surface disturbance and runoff, but the long-term impacts would benefit the species that would use the restored habitat. Giving priority for implementing specific sage-grouse habitat restoration projects could impact Special Status Species similarly as the above actions. Special status wildlife using grassland habitat, such as mountain plover, long-billed curlew or white-tailed prairie dog could be displaced as the habitat is converted, possibly to lower quality habitat or areas with more competition for resources.

Establishing seed harvest areas that are managed for seed production for fire prone areas could ensure that seed is available for habitat restoration, providing habitat for sagebrush obligate special status wildlife or other Special Status Species.

Ensuring that grasshopper and Mormon cricket control could only occur in Greater Sage-Grouse priority habitat where it can be demonstrated that it is beneficial to Greater Sage-Grouse would reduce the impacts described under Alternative A.

Impacts from the management of wild horses with the consideration of Greater Sage-Grouse populations within priority habitat could benefit Special Status Species habitat. Conducting land health assessments in all BLM herd management areas (HMA) within Greater Sage-Grouse priority habitat could identify where habitat improvements could occur. Wild horses can compete with special status wildlife species for forage, habitat, cover, and water. Any management that could improve habitat for Greater Sage-Grouse could also benefit special status wildlife, especially those who are sagebrush obligate or those who use sagebrush for some part of their life cycle. Management of wild horses to consider wildlife, watershed, and other resource needs could provide special status wildlife with adequate forage, habitat cover, and water. Water developments to improve herd distribution and manage forage utilization for wild horses could reduce pressure on areas where wildlife frequent and disperse wild horses elsewhere.

Designing and implementing fuels treatments with an emphasis on protecting existing sagebrush ecosystems in Greater Sage-Grouse priority habitat could have short- and long-term impacts to Special Status Species habitat. The emphasis on protecting sagebrush ecosystems could protect sagebrush obligate habitat, forage, and cover within these areas. Impacts to Special Status Species from rehabilitation for areas burned by wildland fires would be the same as Alternative A, but would apply to the Greater Sage-Grouse priority habitat area and could receive additional recovery effort.

Impacts to wildlife from the use of prescribed fire would be the same as Alternative A, but would apply to the entire Greater Sage-Grouse priority habitat area. The additional restriction to precipitation levels could prevent long-term habitat loss from the use of fire in areas where the lack of rainfall makes revegetation and restoration prohibitive. Cheatgrass can also quickly recover from fire, and could continue to spread and out-compete native grasses, altering native habitat and creating monocultures. Special status plant species could be protected from vegetation loss or damage, erosion and soil loss, and the introduction and spread of invasive, non-native plant species.

Designing post fuels management areas to ensure long-term persistence of seeded or pre-burn native plants using temporary or long-term changes in livestock grazing, wild horse, and travel management, etc. could allow treated areas to revegetate, soils to stabilize, and for vegetation to mature to the point of withstanding pressure from grazing or other activities. Changing management in restored areas could allow seedings to become established and areas to recover for future use by Special Status Species.

Prioritizing fire suppression to protect Greater Sage-Grouse priority habitat could prevent the loss of sagebrush habitat and is very important to protecting and maintaining existing sagebrush habitat (Braun et al. 2005). Fire suppression techniques could impact nearby special status wildlife species in areas where

they occur. Vegetation removal, crushing of habitat, the use of heavy equipment and fire retardant, and human presence could force Special Status Species from the area where these activities occurred to less desirable, lower quality habitat until these areas have recovered.

The use of monitoring plans could provide benefits to wildlife within Greater Sage-Grouse habitat by studying the effectiveness of conservation efforts for sage-grouse by confirming habitat is being improved or that current management is not meeting the objectives laid out in their projects. If Greater Sage-Grouse habitat is meeting objectives, then Special Status Species could be benefitting from the habitat as well. If habitat is not meeting objectives, Special Status Species could be impacted, and through monitoring, improvements could be made which then could provide habitat benefits to Special Status Species. Making improvements could provide overall improvements in landscape health, prevent or reduce the spread of invasive, non-native plant species, provide additional forage, and allow for greater cover habitat for Special Status Species.

Under Alternative B, management would not allow discrete anthropogenic disturbances to cover more than 3% of the total sage-grouse habitat regardless of ownership within Greater Sage-Grouse priority habitat. The density of disruptive activities under Alternative B for Greater Sage-Grouse priority habitat would provide the lowest density of disturbance of habitat. If Alternative B were applied, Special Status Species could be affected by lower losses of habitat as compared to Alternative A. This alternative could provide for more contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects Special Status Species from human and other disturbance and is necessary for special status wildlife to breed, migrate, forage, seek cover, and complete their life histories. Development of anthropogenic features can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force Special Status Species to move from high quality habitat to areas of lower quality, less desirable habitat. Capping disturbance from roads, structures, power lines, drilling operations, and human disturbance could remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A. Within Greater Sage-Grouse connectivity areas, a 3% disturbance cap per section (640 acres). This management also applies when permitting APDs on existing leases that are not yet developed.

Using mitigation to restore habitat to maintain the 3% disturbance limit could be effective for rehabilitating Special Status Species habitat and continuing to provide contiguous uninterrupted habitat with minimal disturbance. However, restoration of mature sagebrush habitat takes 15 to 30 years, so usable habitat may not be available for many years after the rehabilitation takes place.

Not allowing new surface occupancy on federal oil and gas leases within Greater Sage-Grouse priority and connectivity habitat (2,082,140 acres) could reduce habitat loss for Special Status Species and would allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects Special Status Species from human and other disturbance and is necessary for special status wildlife to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species, which can force special status wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Special status plant species could be affected by vegetation loss or damage, erosion and soil loss, and the introduction and spread of invasive, non-native plant species. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A. A four-mile buffer around leks could reduce or prevent impacts to Special Status Species from disturbance from noise, human and vehicle presence, and drilling activities; however, special status wildlife habitat could be impacted from oil and gas development by surface disturbance, habitat loss, erosion, and the spread of invasive, non-native plant species. Surface disturbance also causes barriers in contiguous habitat which can disrupt special status

wildlife travel and migration patterns, and could lead to reduced health and reproductive success in some Special Status Species.

Applying a restriction on exploratory drilling that prohibits surface disturbing activity during nesting and early brood-rearing season in Greater Sage-Grouse priority habitat could protect the habitat identified as suitable and the Special Status Species that use or occur within the identified area. This management could allow for fewer disturbances to wildlife from noise, human presence, vehicle use, vegetation loss, and the introduction and spread of invasive, non-native plant species, which can force Special Status Species to move from high quality habitat to areas of lower quality, less desirable habitat.

Surface-disturbing and disruptive activities in mapped Greater Sage-Grouse winter concentration areas would be prohibited inside and outside Greater Sage-Grouse priority habitat areas, as well as for connectivity areas. Management under Alternative B would protect the mapped winter concentration habitat throughout the year from habitat loss and would provide greater protection to habitat as compared to Alternative A. Preventing surface disturbance could reduce barriers in contiguous habitat, preventing disruptions in Special Status Species travel and migration patterns, and could provide special status wildlife continued health and reproductive success, especially for those species that use winter concentration habitat such as pygmy rabbit.

Limitations on noise would have similar impacts to Special Status Species but on a larger scale covering the entire planning area, as compared to Alternative A.

The use of adaptive management strategies in support of the population management objectives for Greater Sage-Grouse set by the State of Wyoming (Wyoming's Governor's Executive Order 2011-5 [WY EO 2011-05]) could provide Special Status Species additional habitat protection though additional management for sage-grouse and sagebrush habitat.

Greater Sage-Grouse–Alternative B

The following impacts apply to Alternatives B, C, and D and the Proposed LUP Amendments:

The continued support of the development of statewide Greater Sage-Grouse seasonal habitat models for the State of Wyoming would benefit Greater Sage-Grouse from seasonal habitat modeling and identification. Seasonal habitat is critical to the reproduction and survival of the species; identification of these areas allows for protection of habitat and keeping contiguous expanses of contiguous habitat intact.

Implementing direct mitigation, utilizing BMPs, and conducting offsite compensatory mitigation would help maintain or improve habitat for Greater Sage-Grouse and would minimize vegetation loss and soil erosion which would maintain or improve water quality. Utilizing LWG plans, analyses, and other sources of information to guide development of conservation objectives for local management of Greater Sage-Grouse habitats provides additional data and resources to aid in the protection and management of Greater Sage-Grouse habitat. These measures could protect or enhance habitat where projects occur outside of BLM lands, providing additional areas habitat connectivity.

Application of appropriate seasonal restrictions when implementing vegetation management treatments for seasonal habitats in Greater Sage-Grouse priority habitat could prevent impacts to Greater Sage-Grouse during sensitive life phases and within important habitat. Monitoring the treatments could provide valuable feedback to whether the treatments were successful or not and if changes in Greater Sage-Grouse population numbers result from the treatments.

Ensuring site-specific, measurable, conservation, and mitigation objectives are included in project planning within Greater Sage-Grouse habitats could help sagebrush habitat recover after projects were completed and could assist in maintaining habitat and disturbance of Greater Sage-Grouse during project development.

Developing landscape-scale restoration/conservation and maintenance strategies, including special management of seasonal habitats and connectivity zones outside of Greater Sage-Grouse core/priority habitat areas, with voluntary partners and cooperating agencies could protect uninterrupted expanses of sagebrush habitat; but impacts would be dependent on the types of strategies implemented.

Using Integrated Vegetation Management per BLM Handbook H-1740-2 and Forest Service Manual 2080 and designing all range projects to minimize potential for invasive species establishment could help prevent the spread and inundation of invasive, non-native plant species. Invasive, non-native plant species can proliferate in disturbed areas and permanently damage native ecosystems if not prevented or quickly eradicated. The spread of invasive, non-native plant species could also lead to further habitat fragmentation, reducing the ability of Greater Sage-Grouse to move from seasonal habitat areas. Monitoring and treating invasive species associated with existing range improvements could also prevent the establishment and spread of invasive, non-native plant species.

Applying RDFs (Appendix B) as mandatory stipulations/COAs within core/priority sage-grouse habitat for fluid minerals, travel management, lands and realty, range management, wild horses, solid minerals-coal, West Nile virus, mineral materials, non-energy solid leasable minerals, vegetation management, fire and fuels management, and noise where applicable, appropriate, and technically feasible, could ensure uninterrupted expanses of sagebrush habitat, providing Greater Sage-Grouse with fewer disruptions of habitat, improved forage and cover, and measures applied to protect sage-grouse within Greater Sage-Grouse core/priority habitat areas.

Sagebrush habitat could be protected or improved where operators agree to implement additional conservation measure for their approved leases within Greater Sage-Grouse core/priority habitat. The degree and scale depends on which measures are implemented. In these cases, site-specific NEPA would occur and appropriate restrictions would apply.

Incorporating new occupied Greater Sage-Grouse into core areas for management as they are found would provide additional management and protection to Greater Sage-Grouse found within these areas. Continued ground-truth efforts for statewide Greater Sage-Grouse models could contribute data to provide more accuracy for the modeling effort. Using the sage-grouse Habitat Assessment Framework, or best available assessment tool for evaluating Greater Sage-Grouse habitats, would allow BLM wildlife biologists to survey for habitat value with the greatest accuracy and would provide rich data to support conservation, protection, and improvement of these habitats. Annual meetings and reviews of lek data with WGFD could provide continued communication and data transfer between agencies.

Working with proponents holding valid existing leases to provide additional protections (see Management Action 17) to sagebrush habitat could reduce habitat loss and disturbance to Greater Sage-Grouse and could allow for contiguous, uninterrupted habitat. It is unknown, however, what level of long-term protection of habitat would occur, because the outcome is at each leaseholder's discretion. If leaseholders/project proponents agree to additional protections for their lease, there would be a reduction in additional habitat loss and fragmentation due to oil and gas development by protecting existing habitat resources from new development with buffer distances, additional reclamation, or seasonal closures. This would occur for all projects both inside and outside Greater Sage-Grouse core habitat, which would allow for greater protections because habitat outside Greater Sage-Grouse core habitat would be included.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within Greater Sage-Grouse core habitats could limit impacts to sage-grouse from vehicle use. The miles of routes that could be limited cannot be determined until transportation planning is completed, but limiting new roads, routes, and cross-country travel until the planning occurs could prevent some disturbance to Greater Sage-Grouse. Cross country vehicle use can open up corridors that could be used by predatory animals, and additional vehicle traffic could use the pathway. Vehicles could cause mortality from crushing nesting birds or colliding with grouse. Linear disturbances can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following vehicle passage.

Completing activity level travel plans within five years of the ROD would provide each BLM and Forest Service office the opportunity to address and analyze transportation routes that fragment Greater Sage-Grouse or other sensitive habitat. Designating routes during activity level planning in priority habitat with current administrative/agency purpose or need to administrative access only could reduce the level of road/route use. Reducing road/route use could decrease the level of disturbance to Greater Sage-Grouse from vehicle and human presence, or collisions from vehicles. Assessing existing plans for consistency with sage-grouse conservation objectives could allow BLM/Forest Service to make changes to routes/roads that could reduce further impacts to Greater Sage-Grouse and sagebrush habitat.

The construction of roads to minimum design standards needed for production activities within Greater Sage-Grouse core habitats, in compliance with the DDCT could reduce the amount of disturbance from road construction in some cases. Road construction can cause habitat and vegetation loss, erosion, sedimentation, and runoff. The spread of invasive, non-native plant species may also occur during or following road construction, which can further damage habitat. Human presence and vehicles may force Greater Sage-Grouse species away from desired habitat to lower quality, less desirable habitat, creating additional stress for Greater Sage-Grouse.

Working with project proponents in siting projects in locations containing the least sensitive habitats to minimize impacts to sensitive resources could reduce loss of higher quality habitat for Greater Sage-Grouse that use or inhabit these areas and may allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects species from human and other disturbance. Disturbance can result in sage-grouse moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates and result in a decline in Greater Sage-Grouse populations.

The following impacts apply only to Alternative B:

Under Alternative B, new transmission corridors would not be authorized within Greater Sage-Grouse priority and connectivity areas which would prevent habitat loss from linear corridors within the area and could protect sage-grouse habitat from removal, loss, degradation, and invasion of exotic plant species. Prohibiting new above-ground structures both inside and outside existing corridors would prevent new perch sites for raptors that prey on grouse, protecting Greater Sage-Grouse from the threat of increased or perceived predation, as well as preventing new habitat loss, disturbance, or life-cycle disruption; all of which would protect Greater Sage-Grouse and sagebrush habitat. Prohibiting new above-ground structures would also prevent new habitat loss, disturbance, or life-cycle disruption, all of which would protect Greater Sage-Grouse. The lack of elevated structures of various types would reduce perch sites for raptors that prey on grouse, protecting Greater Sage-Grouse from the threat of additional predation. Linear corridors are desirable areas for predatory animals, such as raptors and red fox; reducing these areas could be beneficial to Greater Sage-Grouse by preventing actual or perceived threats of overhead predation. Preventing overhead structures in these areas could reduce the risk of predation from overhead predators. The risk of collision or electrocution of Greater Sage-Grouse could be reduced where overhead structures are not

allowed. Maintenance and upgrades of existing structures could result in short-term disturbance of habitat from human and vehicle activity, but long-term impacts would be minimal.

In priority Greater Sage-Grouse habitat, relocating existing designated ROW corridors void of authorized ROWs or undesignating the corridor could prevent future disturbance to Greater Sage-Grouse habitat from the construction of transmission lines or other linear ROW, as described above.

Under Alternative B, in priority Greater Sage-Grouse habitat, 5,271,440 acres would be managed as exclusion areas for new ROW/SUA permits, which could protect 4,985,510 more acres than in Alternative A. General Greater Sage-Grouse habitat would encompass 6,357,180 acres of avoidance area, 3,896,840 more acres than Alternative A. Impacts to Greater Sage-Grouse and sagebrush habitat in these areas would be the same as Alternative A, although much larger areas would be managed as exclusion and avoidance areas as compared to Alternative A. Co-locating ROWs or SUAs could reduce overall disturbance to new habitat; however, disturbance could still occur during development within the existing corridor. Construction within existing corridors could result in vegetation loss and the spread of invasive, non-native plant species could occur during or following construction. Construction activities could disturb Greater Sage-Grouse, possibly causing birds to vacate the area into lower quality habitat. Moving from desirable habitat can result in mortality or lower reproductive rates and hatchling survival. Collisions with vehicles may also occur during construction. Corridors are desirable areas for predatory animals, such as raptors and fox, but these areas may be avoided by prey species which may move to less desirable habitat to avoid predation. A 3% disturbance cap could further prevent habitat loss and disturbance to Greater Sage-Grouse. Mitigation to offset exceeding the 3% cap could provide habitat for Greater Sage-Grouse, but revegetation of effective sagebrush habitat can take 10 or more years, depending on soil conditions, climate and weather, viability of seed and/or transplants, and ongoing maintenance to prevent invasive, non-native plant species from taking over the area.

Removing, modifying or burying existing power lines, reclaiming linear features such as roads or fences, or removal of facilities and reclamation of well sites could provide benefits to Greater Sage-Grouse. Removing, modifying or burying existing power lines could reduce the risk of collision or electrocution of Greater Sage-Grouse. Greater Sage-Grouse would be less likely to be subject to hunting from predatory bird species; or would be less likely to abandon habitat from the perceived threats of overhead predation. Removal of fences reduces threats of injury or death from impacts to fences, opens up travel corridors, and could allow access to additional forage and cover. There would be short-term disturbance during reclamation and some initial habitat loss before vegetation returns. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. During reclamation, human and vehicle presence could cause Greater Sage-Grouse to vacate the area to lower quality habitat. Moving from desirable habitat can result in reduced health, making grouse susceptible to disease, predation, or reduced reproductive success.

Under Alternative B, wind development in Greater Sage-Grouse priority habitat would be excluded. In Greater Sage-Grouse general habitat, 127 turbines are projected to be developed, 1,127 fewer than under Alternative A. The development of wind energy outside of Greater Sage-Grouse priority habitat areas could cause habitat loss and both short and long-term impacts to Greater Sage-Grouse and sagebrush habitat where development occurred on or near sage-grouse or sagebrush habitat, which is greatly reduced in areas outside of priority habitat although impacts could still occur. Impacts from wind development in Greater Sage-Grouse general habitat would be the same as described under Alternative A, but for fewer numbers of turbines.

Prohibiting MET towers in Greater Sage-Grouse priority habitat could prevent perching of raptors and removing collision obstacles within sagebrush habitat to a greater degree than in Alternative A.

Retaining public ownership of Greater Sage-Grouse priority habitat would ensure that management within these areas would protect sagebrush habitat with all of the BMPs and other designations, which could provide habitat protection and contiguous habitat for Greater Sage-Grouse, and would provide greater protections than Alternative A. Mitigation measures for land disposals with similar protections could provide habitat protection for Greater Sage-Grouse and sagebrush habitat. Acquisitions or conservation easements (in lieu of acquisitions) could allow for additional management for sagebrush habitat and protection of Greater Sage-Grouse. Seeking to acquire state and private lands with intact subsurface mineral estate or BLM-administered lands or National Forest System lands that need subsurface mineral estate by donation, purchase, or exchange could allow for additional management for Greater Sage-Grouse and sagebrush habitat.

Not recommending withdrawal proposals that are not associated with mineral activity in Greater Sage-Grouse priority habitat unless the land management is consistent with Greater Sage-Grouse conservation measures could allow for additional management for Greater Sage-Grouse and sagebrush habitat. Incorporating a light grazing strategy utilizing 20-30% forage allocation for livestock in allotments not meeting standards in Greater Sage-Grouse priority habitat could provide an opportunity for forbs, grasses, and sagebrush to restore for forage and cover Greater Sage-Grouse. Working cooperatively on integrated ranch planning within Greater Sage-Grouse habitat (in Greater Sage-Grouse priority habitat) could allow for coordinated planning between ranchers and federal agencies by planning in single units, and could lead to fewer disturbances to Greater Sage-Grouse.

Impacts would be the same as Alternative A for management of rangelands, vegetation, and livestock grazing. In addition, Alternative B would require more stringent management from assessments to include indicators and measurements of structure, condition, and composition of vegetation specific to achieving sage-grouse habitat objectives, or by using sage-grouse habitat recommendations from Connelly et al. 2000 and Hagen et al. 2007, prioritizing completion of land health assessments, and using ESD could allow for more frequent feedback on habitat conditions where livestock grazing and Greater Sage-Grouse habitat overlaps. Monitoring could provide information as to where objectives are not being met and could lead to effective procedures to take proper steps to ensure that those areas can meet habitat objectives, and provide adequate cover and forage, and if Greater Sage-Grouse are returning to the area.

Reducing the procedures to retire grazing allotments could allow habitat to recover from the use of livestock, which could provide additional habitat and forage for Greater Sage-Grouse.

Impacts to Greater Sage-Grouse from conservation plan development to modify grazing management to meet seasonal Greater Sage-Grouse habitat requirements in Greater Sage-Grouse priority habitat would be the same as Alternative A. In addition, including terms and conditions on grazing permits and leases that assure plant growth requirements are met, and residual forage remains available for Greater Sage-Grouse hiding cover would ensure that Greater Sage-Grouse would have essential habitat components and could reduce impacts of livestock grazing on sage-grouse.

Impacts to Greater Sage-Grouse from the retirement of grazing privileges would be the same as Alternative A, but could be applied a larger area within Greater Sage-Grouse priority habitat. Identifying specific allotment(s) where permanent retirement of grazing privileges is potentially beneficial to Greater Sage-Grouse could provide Greater Sage-Grouse with larger areas of contiguous, uninterrupted habitat with desirable habitat components such as adequate forage and cover species. Impacts to Greater Sage-Grouse from managing the effects of drought and other conditions in livestock allotments would be the same as Alternative A, but would apply to all Greater Sage-Grouse priority habitat. Additional priority for Greater Sage-Grouse habitat during periods of drought would ensure that Greater Sage-Grouse would have continued habitat, residual grass cover for nesting, and forage during and following drought events.

Impacts to Greater Sage-Grouse from range improvement projects would be the same as Alternative A. In addition, designing any new structural range improvements and location of supplements (salt or protein blocks) to conserve, enhance, or restore Greater Sage-Grouse habitat through an improved grazing management system relative to Greater Sage-Grouse objectives and other considerations for range improvements within Greater Sage-Grouse priority habitat could be beneficial to sage-grouse. Any actions that would keep livestock from congregating on or near sage-grouse habitat, such as placement of water improvements or location of supplements, would reduce impacts to Greater Sage-Grouse from harassment, displacement, and habitat and/or forage loss (Sage-Grouse Communications Committee 2005). Removing, modifying, or marking fences in high risk areas could reduce injury or mortality from collisions with fences. Studies in Wyoming show that fence markers can reduce sage-grouse mortality from wire fence collision by 70% (Christiansen 2009, Stevens et al 2012). Where fences are constructed with perch inhibitors for raptors, Greater Sage-Grouse would be less likely to be subject to hunting from predatory bird species. Removal of fences reduces threats of injury or death from impacts to fences, opens up travel corridors, and could allow access to additional forage and cover habitat.

Impacts to Greater Sage-Grouse from management of riparian, springs, and seep areas would be the same as Alternative A. The additional management for wet meadows and riparian areas would provide habitat protection of important summer-late brood-rearing habitat and habitat critical to Greater Sage-Grouse for late-growing season foraging (Crawford et al. 2004). Additional management to reduce hot season grazing and for edge habitat in wet meadows could ensure sufficient habitat and forage for late brood-rearing habitat. Using fencing/herding techniques could provide habitat improvements for Greater Sage-Grouse depending on the technique and season of use. Beck and Mitchell (2000) suggested that livestock could be used occasionally within wet meadow exclosures to reduce old vegetation and to stimulate forb growth.

Impacts to Greater Sage-Grouse from water development would be the same as Alternative A; however, implementing development in springs and seeps only where it would either benefit or have neutral impacts to Greater Sage-Grouse could provide additional protection of sensitive and important late brood-rearing habitat for sage-grouse.

Not allowing any exceptions to lease stipulations would prevent additional surface disturbing activities in Greater Sage-Grouse habitat, which reduces disturbance from roads, structures, power lines, and human activity and could allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat is necessary for Greater Sage-Grouse to breed, travel, and complete their life histories, and can protect Greater Sage-Grouse from human and other disturbance.

Closing Greater Sage-Grouse priority habitat areas to fluid mineral leasing, 6,886,890 acres, would greatly reduce habitat loss for sage-grouse and would allow for contiguous, uninterrupted habitat and would close 6,015,110 more acres than Alternative A. Contiguous, uninterrupted habitat protects Greater Sage-Grouse from human and other disturbance and is necessary for sage-grouse to breed, migrate, and complete their life histories. Disturbance can result in sage-grouse moving from high quality habitat to areas of lower quality, less desirable habitat and could lead to reduced fecundity and vulnerability to predators. Oil and gas development within two to four miles of leks and nesting/early brood rearing habitat has been studied to show that Greater Sage-Grouse need large buffer distances for viable populations to persist (Connelly et al. 2000, Holloran and Anderson 2005, Walker et al. 2007). Removing disturbance from roads, structures, power lines, and human disturbance from oil and gas development would be the strongest solution to protect Greater Sage-Grouse habitat and prevent further loss of Greater Sage-Grouse populations.

Oil, gas, and CBNG leasing and development would still be available outside of Greater Sage-Grouse priority in Greater Sage-Grouse general habitat. Impacts from exploration and development activities would be the same as described under Alternative A for oil, gas, and CBNG development; however, only 13,709 wells are predicted to be developed outside of Greater Sage-Grouse priority habitat under Alternative B,

2,702 fewer wells as compared to Alternative A. Under Alternative B, only 33,530 acres of short-term disturbance would occur, 5,520 acres fewer than Alternative A, and 104,050 acres of long-term disturbance would remain under Alternative B, 26,280 acres fewer than Alternative A. The lower number of acres disturbed by oil and gas development would provide even greater protections to Greater Sage-Grouse habitat as compared to Alternative A.

Impacts from geophysical exploration to Greater Sage-Grouse would be the same as Alternative A. Some impacts could be reduced by using helicopter-portable drilling or wheeled or tracked vehicles on existing roads in accordance with seasonal timing limitations and other restrictions that may apply. Using helicopters or existing roads for geophysical exploration could reduce linear disturbances to vegetation created by vibroseis or vehicles thereby preventing impacts to Greater Sage-Grouse from vegetation damage, crushing of habitat, nests, eggs, or young, or linear disturbances that interrupt migration corridors or allow for increased predation.

Impacts to Greater Sage-Grouse from offsite mitigation would be the same as Alternative A. In addition, applying COAs, mitigating or reducing the impact to Greater Sage-Grouse priority habitat during lease development could reduce or prevent sagebrush habitat loss and could allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat provides unobstructed migration corridors and is necessary for Greater Sage-Grouse to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in habitat loss, noise, human presence, vehicle use, vegetation loss, and the introduction and spread of invasive, non-native plant species which can force Greater Sage-Grouse to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future leases could occur under the other action alternatives.

Working with proponents holding valid existing leases to promote measurable Greater Sage-Grouse conservation objectives could reduce habitat loss and disturbance to sagebrush habitat and Greater Sage-Grouse and could allow for contiguous, uninterrupted habitat. It is unknown, however, what level of long-term protection of habitat would occur, because the outcome is at each leaseholder's discretion. If leaseholders/project proponents agree to additional protections for their lease, there would be a reduction in additional habitat loss and fragmentation due to oil and gas development by protecting existing habitat resources from new development with buffer distances, additional reclamation, or seasonal closures. This would occur for all projects both inside and outside Greater Sage-Grouse priority habitat, which would allow for greater protections as habitat outside Greater Sage-Grouse priority habitat would be included.

Working with project proponents in siting projects, in locations containing the least sensitive habitats to minimize impacts to sensitive resources, could reduce loss of higher quality habitat for Greater Sage-Grouse that use or inhabit these areas and may allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects species from human and other disturbance. Disturbance can result in sage-grouse moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates and result in a decline in Greater Sage-Grouse populations.

Not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat to oil and gas leasing, 2,082,140 acres, would prevent the development of wellpads and installation of tanks and surface infrastructure. This management could reduce direct habitat loss and impacts to Greater Sage-Grouse and would allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects Greater Sage-Grouse from human and other disturbance and is necessary for Greater Sage-Grouse to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-

native plant species which can force Greater Sage-Grouse to desert the area. If suitable habitat is not found, grouse may not reproduce and will eventually perish. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A.

A four-mile buffer around a lek could reduce or prevent impacts to Greater Sage-Grouse from disturbance from noise, human and vehicle presence, and drilling activities in the buffer area; Greater Sage-Grouse could still be impacted from oil and gas development by surface disturbance, habitat loss, erosion, and the spread of invasive, non-native plant species. Surface disturbance also disrupts contiguous habitat, which can inhibit Greater Sage-Grouse travel and migration patterns, and could lead to reduced health and reproductive success in Greater Sage-Grouse. Walker et al. (2007) recommends a buffer distance of at least four miles containing extensive stands of sagebrush habitat for breeding populations to persist. This management could provide that buffer area and reduce some impacts to Greater Sage-Grouse from the presence of humans, vehicles, infrastructure, roads, and other disruptions in habitat.

Completing Master Development Plans during planning and review of projects involving multiple proposed disturbances within a lease or priority habitat area, without an exception for individual wildcat (exploratory) wells could provide fewer impacts to Greater Sage-Grouse from surface disturbance from consolidated planning of infrastructure within the development area. Requiring unitization within Greater Sage-Grouse priority habitat when deemed necessary for proper development and operation of an area (with strong oversight and monitoring) could consolidate development and infrastructure, reducing impacts to Greater Sage-Grouse from surface disturbing activities (Marranzino et al. 2011).

Requiring full reclamation bonds sufficient to restore lands to prior disturbance conditions could provide funding to complete habitat improvement and recovery in areas disturbed by oil, gas, and other surface disturbing activities if project abandonment occurs. Full restoration of habitat could provide Greater Sage-Grouse forage and cover depending on the habitat being restored; however, it is uncertain if repopulation of the area would occur (Connelly et al. 2000).

Private lands are not required to apply mitigation measures, which can cause further impacts to habitat loss and displacement of Greater Sage-Grouse. Impacts to Greater Sage-Grouse habitat from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative A, but on a larger scale for the entire planning area.

Under Alternative B, 6,992,690 acres would be closed to non-energy, solid mineral leasing. Impacts to Greater Sage-Grouse from coal leasing in lands outside of priority Greater Sage-Grouse habitat would be the same as described in Alternative A. In addition, finding Greater Sage-Grouse priority habitat unsuitable to all surface mining of coal under the criteria set forth in 43 CFR 3461.5 would prevent surface disturbance, direct habitat loss or damage, and the introduction or spread of invasive, non-native plant species. Impacts such as displacement of Greater Sage-Grouse from surface mining activities, avoidance of the area around the development because of human and vehicle presence and noise forcing grouse to abandon habitat could be avoided if surface mining for coal was found unsuitable. Not allowing coal exploration in Greater Sage-Grouse priority habitat would prevent the impacts described under Alternative A.

Granting no new underground mining leases, unless all surface disturbances (appurtenant facilities) are placed outside of the Greater Sage-Grouse priority habitat area, would reduce surface disturbance, forage and habitat loss compared to Alternative A. Human presence and vehicle use to access the mine could cause displacement of grouse from vehicles and noise, or avoidance of a larger area around the development because of human presence, vehicles and noise, and possible collisions from vehicles. Vehicle routes are

prone to use by predators which could impact Greater Sage-Grouse from direct predation or cause grouse to avoid those areas.

Allowing appurtenant facilities by co-locating them or building facilities to minimum standards could result in surface disturbance or habitat loss and the introduction or spread of invasive, non-native plant species. The management could reduce overall disturbance to new habitat; however, disturbance could occur within an existing corridor. Noise, human presence, vehicle use, and linear disturbances impact Greater Sage-Grouse and could cause them to abandon the surrounding area, forcing birds into areas of habitat with increased competition from other displaced grouse or into areas of reduced habitat quality causing further stress and reduced fecundity and longevity.

Closing Greater Sage-Grouse priority habitat to non-energy leasable mineral leasing (6,992,690 acres) would prevent the impacts described under Alternative A.

If all lands recommended for withdrawal from mineral entry within Greater Sage-Grouse priority habitat were withdrawn, 5,044,800 more acres of Greater Sage-Grouse habitat could be protected from disturbance and habitat loss as compared to Alternative A. Allowing the majority of sage-grouse priority habitat to remain intact and unfragmented by mining activities could provide Greater Sage-Grouse contiguous habitat, free from anthropogenic disturbance, reduced areas of invasive, non-native plant species, and quality sagebrush habitat to support healthy grouse populations. Additional mitigation, seasonal restrictions, or making withdrawal areas subject to validity exams or buy out could reduce further habitat disturbance or damage, or in some cases, improvement in habitat for Greater Sage-Grouse.

Under Alternative B, 6,992,690 acres would be closed to mineral material sales, exploration, and free use permits, 6,519,890 more acres as compared to Alternative A. Greater Sage-Grouse within these areas would not be impacted by displacement from exploration or pit areas, abandoning habitat within the area around the development because of human presence and noise, and possible offsite impacts, including the spread of invasive, non-native plant species. Restoring salable mineral pits within Greater Sage-Grouse priority habitat could cause short-term impacts to Greater Sage-Grouse from restoration activities by human and vehicle presence, noise, or surface disturbance and runoff if Greater Sage-Grouse remained in the surrounding area. Long-term, when the habitat recovered, it could be beneficial to Greater Sage-Grouse by providing sagebrush habitat.

Allowing BLM SRPs and Forest Service RSUAs in Greater Sage-Grouse priority habitat that have neutral or beneficial effects to priority habitat areas could reduce the impacts to Greater Sage-Grouse and sagebrush habitat from recreational activities and human presence as compared to Alternative A.

Greater Sage-Grouse priority habitat areas would be designated as Greater Sage-Grouse conservation ACECs/SIAs, 5,025,550 acres. Greater Sage-Grouse and sagebrush habitat would receive the benefits of management under an ACEC/SIA. This management would be focused on the protection of Greater Sage-Grouse and sagebrush habitat, which could further protect and preserve sage-grouse and their habitat.

Designating all OHV “open” areas within Greater Sage-Grouse priority habitat areas as limited to designated roads and trails (not including the sand dune portions of these areas) (Poison Spider OHV Park [285 acres]; Dune Pond Cooperative Management Area [3,736 acres]; and the portion of the Greater Sand Dunes Recreation Area [529 acres]) would protect the non-sand dune landscape from surface disturbance and disruptive activity from cross-country use by vehicles and human presence. Because these areas are existing use areas, it is likely that Greater Sage-Grouse have already abandoned use of the area or avoid it during migrations. Limiting the use to designated roads and trails could reduce the likelihood of vehicle collisions and could encourage Greater Sage-Grouse to return to previously abandoned habitat. The sand

dunes would remain an open use area, which is not desired habitat for sage-grouse and the major disturbance to sage-grouse from these areas would be noise from OHVs.

Limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative A. Completing activity level travel plans within five years of the ROD would provide each BLM and Forest Service office the opportunity to address and analyze transportation routes that fragment Greater Sage-Grouse or other sensitive habitat. Designating routes during activity level planning in priority habitat with current administrative/agency purpose or need to administrative access only could reduce the level of road/route use. Reducing road/route use could decrease the level of disturbance to Greater Sage-Grouse leks or sensitive habitat from vehicle and human presence, collisions with vehicles, increased predation, or the spread of invasive, non-native plant species. Assessing existing plans for consistency with Greater Sage-Grouse conservation objectives could allow the BLM and Forest Service to make changes to routes/roads that could reduce further impacts to Greater Sage-Grouse.

Not upgrading existing routes could reduce surface disturbance and habitat loss from upgrading activities and displacement of Greater Sage-Grouse from human and vehicle presence. Any exceptions resulting in road upgrades could further fragment habitat, cause vegetation loss, erosion, and the spread of invasive, non-native plant species. Human presence and vehicles may force Greater Sage-Grouse species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles and increased predation may also occur when roads are constructed within Greater Sage-Grouse habitat.

Using existing roads to access valid existing rights could prevent vegetation and habitat loss, noise, and the presence of humans, vehicles, and construction equipment that are associated with road construction. New road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Human presence and vehicles may cause Greater Sage-Grouse to abandon habitat and move to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within Greater Sage-Grouse habitat. Road corridors are desirable areas for predatory animals and could increase the threat of predation to grouse. All of these impacts could be avoided by using existing roads. Increased use of roads during lease development could occur which could increase impacts to Greater Sage-Grouse from collisions with vehicles. If new roads were necessary, impacts to Greater Sage-Grouse and habitat described above could apply. A 3% disturbance cap could further prevent habitat loss and disturbance to Greater Sage-Grouse if new roads had to be built. Mitigation to offset exceeding the 3% cap could provide new habitat (where possible) to replace habitat that was lost during construction, but impacts from roads and construction would still affect Greater Sage-Grouse, and new habitat would take at least five or more years to revegetate and 15-30 years to be fully restored (BLM 2004i).

Restoring roads or trails not designated in travel management plans within Greater Sage-Grouse priority habitat could reduce disturbances from occasional vehicle or human use and could improve sagebrush habitat conditions by removing linear disturbances, allowing for greater habitat connectivity, and providing additional vegetation resources for forage or cover. Vehicle routes are prone to use by predators, Greater Sage-Grouse could benefit from the rehabilitation of unused roads or trails, which could reduce the presence of predatory animals as roads and routes are reclaimed. Short-term impacts to Greater Sage-Grouse could occur during the restoration process from human and vehicle presence, but long-term vegetation regeneration to sagebrush habitat could provide grouse with new forage or cover. Using appropriate seed mixes and transplanted sagebrush for reseeding roads, primitive roads, and trails within Greater Sage-Grouse priority habitat could restore important habitat components for Greater Sage-Grouse.

Managing for vegetation composition and structure consistent with ecological site potential and within the reference state to achieve Greater Sage-Grouse seasonal habitat objectives within Greater Sage-Grouse priority habitat could provide Greater Sage-Grouse habitat, forage, and cover within these areas within 15

to 25 years for sagebrush, but much shorter term for forbs and grasses. Initial treatments could cause short-term impacts from displacement from human and vehicle activities, which could cause Greater Sage-Grouse to move into less desirable habitat and could increase competition for available resources with other species and uses. Using ESD potential in Greater Sage-Grouse habitat to help protect against invasive, non-native plants could prevent the introduction and spread of invasive, non-native plant species which can alter or degrade the native landscape and cause Greater Sage-Grouse to move from high quality habitat to areas of lower quality, less desirable habitat.

Designing and limiting fuels treatments within sagebrush habitat not to reduce sagebrush canopy cover to less than 15% unless a fuels management objective requires additional reduction in sagebrush cover to meet strategic protection of priority Greater Sage-Grouse habitat and conserve habitat quality for the species could provide some protection and limitations to how and when prescribed fire is used in managing sagebrush habitat. Sagebrush in Wyoming can take over 40 years to return to 20% canopy cover due to the climate conditions (Goodrich 2005). Fuel breaks can provide barriers to wildland fires or containing prescribed fire; while fuel breaks remove vegetation, habitat and create linear disturbances, without them, catastrophic fires could occur, destroying habitat, and leaving areas of disturbance. Considering the use of fuel breaks in NEPA documents could allow decision-makers to make an informed decision on the best course of action for each location, especially in areas of high habitat value such as Greater Sage-Grouse winter habitat.

In Greater Sage-Grouse priority habitat, only allowing treatments that conserve, enhance, or restore sage-grouse habitat could provide Greater Sage-Grouse additional habitat, forage, and cover within these areas. Initial treatments could cause displacement from human and vehicle activities which could move animals into less desirable habitat and could increase competition for available resources with other species and uses.

Not allowing treatments in known Greater Sage-Grouse winter range with the exception to strategically reduce wildland fire risk could protect critical and virtually irreplaceable habitat components for Greater Sage-Grouse life cycles. Impacts to Greater Sage-Grouse habitat from resting treated areas from livestock grazing for two years after prescribed burns would be the same as Alternative A, although it would apply to the entire planning area. Impacts to Greater Sage-Grouse habitat from reclamation of Greater Sage-Grouse habitat in accordance to the Wyoming Reclamation Policy (2009a) would be the same as Alternative A.

Where restoration of Greater Sage-Grouse priority habitat occurs, the use of native seeds or other non-native seeds to meet sage-grouse habitat objectives; reestablishment of sagebrush cover and desirable understory plants; restoring native plants and creating landscape patterns that most benefit sage-grouse and considering potential changes in climate could allow for effective restoration of sagebrush and eventual Greater Sage-Grouse habitat. Attempting to use native seeds not only provides appropriate vegetation for the climate and conditions, the use can also prevent the introduction and spread of invasive, non-native plant species which can alter habitat and render it unusable to Greater Sage-Grouse. While the initial disturbance could result in habitat loss, over the long term, sagebrush habitat could be restored, although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Prioritizing areas for restoration could benefit Greater Sage-Grouse in those areas where habitat is restored.

Prioritizing native seed allocation for use in Greater Sage-Grouse priority habitat in years when preferred native seed is in short supply by reallocating from ES&R (BLM) and/or BAER (Forest Service) projects could reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Areas that restore with native plant composition could provide future habitat and cover for

Greater Sage-Grouse. Reallocating seed from projects outside of Greater Sage-Grouse priority habitat to within priority habitat would benefit priority areas where Greater Sage-Grouse habitat is deemed most important; however, it could prevent revegetation projects from occurring in Greater Sage-Grouse general habitat. Managing post ES&R and BAER areas to ensure long-term persistence of seeded or pre-burn native plants using temporary or long-term changes in livestock grazing, wild horse, and travel management, etc. could allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding pressure from grazing or other activities. Changing management in restored areas could allow seedings to become established and areas to recover for future use by Greater Sage-Grouse.

Altering existing seedings where appropriate to benefit Greater Sage-Grouse could provide additional habitat for Greater Sage-Grouse forage and cover. Short-term impacts to Greater Sage-Grouse could occur from restoration activities from human and vehicle presence, noise, surface disturbance or longer term impacts of the possible introduction and spread of invasive, non-native plant species. Where restoration activities were successful, additional sagebrush habitat would benefit Greater Sage-Grouse. Giving priority for implementing specific Sage-grouse habitat restoration projects in annual grasslands could eventually expand Greater Sage-Grouse habitat and possibly provide greater habitat continuity.

Establishing seed harvest areas that are managed for seed production for fire prone areas could ensure that seed is available for habitat restoration, which could provide future sagebrush habitat for Greater Sage-Grouse.

Ensuring that grasshopper and Mormon cricket control could only occur in Greater Sage-Grouse priority habitat where it can be demonstrated that it is beneficial to Greater Sage-Grouse would reduce the impacts described under Alternative A.

Impacts from the management of wild horses with the consideration of Greater Sage-Grouse populations within Greater Sage-Grouse priority habitat could benefit Greater Sage-Grouse from ensuring that sage-grouse habitat would not be diminished or impacted from grazing or trampling from wild horses. Conducting land health assessments in all BLM HMAs and Forest Service WHTs within Greater Sage-Grouse priority habitat could identify where habitat improvements could occur. Wild horses consume grasses, which can be important for Greater Sage-Grouse nesting cover (Crawford et al. 2004). Management of wild horses to consider Greater Sage-Grouse, wildlife, watershed, and other resource needs could provide Greater Sage-Grouse with adequate forage, habitat, cover, and water. Water developments to improve herd distribution and manage forage utilization for wild horses could reduce pressure on areas where wildlife frequent and move wild horses elsewhere, reducing pressure on the surrounding habitat.

Designing and implementing fuels treatments with an emphasis on protecting existing sagebrush ecosystems in Greater Sage-Grouse priority habitat could provide careful use of prescribed fire only in areas where fire would be beneficial to sagebrush habitat. The emphasis on protecting sagebrush ecosystems could protect sagebrush habitat, forage, and cover within these areas. Impacts to Greater Sage-Grouse from rehabilitation for areas burned by wildland fires would be the same as Alternative A, but would apply to the Greater Sage-Grouse priority habitat area and could receive additional recovery effort.

Impacts to Greater Sage-Grouse habitat from the use of prescribed fire would be the same as Alternative A, and would apply to any sagebrush burned within Greater Sage-Grouse priority habitat area. The additional restriction to precipitation level could prevent long-term habitat loss from the use of fire in areas where the lack rainfall makes revegetation and restoration prohibitive.

Designing post fuels management areas to ensure long-term persistence of seeded or pre-burn native plants using temporary or long-term changes in livestock grazing, wild horse, and travel management, etc. could allow treated areas to revegetate, soils to stabilize, and for vegetation to mature to the point of withstanding

pressure from grazing or other activities. Changing management in restored areas could allow seedings to become established and areas to recover for future use by Greater Sage-Grouse. Impacts to Greater Sage-Grouse using wildland fire, prescribed fire, and fire suppression techniques would be the same as Alternative A.

Prioritizing fire suppression to protect Greater Sage-Grouse priority habitat could prevent the loss of sagebrush habitat and is very important to protecting and maintaining existing sagebrush habitat (Braun et al. 2005). Fire suppression techniques could impact nearby Greater Sage-Grouse in areas where they occur. Vegetation removal, crushing of habitat, the use of heavy equipment and fire retardant, and human presence could force Greater Sage-Grouse from the area where these activities occurred to less desirable, lower quality habitat until these areas have recovered.

The use of monitoring plans could provide benefits to Greater Sage-Grouse within priority habitat by studying the effectiveness of conservation efforts for sage-grouse by confirming habitat is being improved, that current management is not meeting the objectives laid out in their projects, and if Greater Sage-Grouse are returning to or using the habitat. If habitat is not meeting objectives, through identification from monitoring, improvements could be made to make the management more effective. Improving project efficacy could provide overall improvements in landscape health, prevent or reduce the spread of invasive, non-native plant species; provide additional forage, and allow for greater cover habitat for Greater Sage-Grouse.

Greater Sage-Grouse are also sensitive to density of disturbance as well as to proximity. Under Alternative B, management would not allow discrete anthropogenic disturbances to cover less than 3% of the total sage-grouse habitat, regardless of ownership, within Greater Sage-Grouse priority habitat. The density of disruptive activities under Alternative B for Greater Sage-Grouse priority habitat would provide the lowest density of disturbance of habitat. If Alternative B were applied, Greater Sage-Grouse could be affected by lower losses of habitat as compared to Alternative A. Holloran's (2005) study showed that the number of males on leks declined when the density of well reached more than five wells within 1.9 miles; and when density was between one and three wells per 1.9 miles, numbers of male birds on leks did not decline. Contiguous, uninterrupted habitat protects Greater Sage-Grouse from human and other disturbance, and is necessary for breeding, migration, foraging, cover habitat, and to grouse complete their life histories.

Development of anthropogenic features can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force Greater Sage-Grouse to abandon important habitat. Capping disturbance from roads, structures, power lines, drilling operations, and human disturbance could remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A. Within Greater Sage-Grouse connectivity areas, a 3% disturbance cap per section (640 acres) would be applied. This management also applies when permitting APDs on existing leases that are not yet developed. Using mitigation to restore habitat to maintain the 3% disturbance limit could be effective for rehabilitating some habitat and continuing to provide contiguous uninterrupted habitat with minimal disturbance. However, restoration of sagebrush habitat takes a minimum of five years, so usable habitat may not be available for many years after the rehabilitation takes place.

Not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority and connectivity habitat on 2,082,140 acres, could reduce habitat loss and allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects Greater Sage-Grouse from human and other disturbance and is necessary for Greater Sage-Grouse to breed, migrate, forage, seek cover, and complete their life histories. The availability of large, uninterrupted areas of sagebrush habitat for Greater Sage-Grouse to forage and nest is likely to influence the size of the breeding populations and persistence of leks (Swenson et al. 1987, Ellis et al. 1989, Schroeder et al. 1999, Leonard et al. 2000, Smith et al. 2005). Oil and gas exploration and

development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species, which can force Greater Sage-Grouse to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A.

A four-mile buffer around leks could reduce or prevent impacts to Greater Sage-Grouse from disturbance from noise, human and vehicle presence, and drilling activities; however, Greater Sage-Grouse habitat could be impacted from oil and gas development by surface disturbance, habitat loss, erosion, and the spread of invasive, non-native plant species. Walker et al. (2007) recommends large areas with extensive stands of sagebrush of approximately four or more miles around leks to allow breeding populations of Greater Sage-Grouse to return to the lek. Surface disturbance also causes barriers in contiguous habitat, which can disrupt Greater Sage-Grouse travel and migration patterns, and could lead to reduced health and reproductive success.

Applying a restriction on exploratory drilling that prohibits surface disturbing activity during nesting and early brood-rearing season in Greater Sage-Grouse priority habitat could protect Greater Sage-Grouse and their young from disturbance from drilling activities, including noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species. Female Greater Sage-Grouse will avoid nesting in areas of development or where disturbing or land-clearing activities occur; such as oil and gas development, roads, urban areas, or cropland (Aldridge and Boyce 2007). If any activity were to occur during this season, females may abandon their nests, or move to less desirable/lower quality habitat for nesting. Moving to lower quality habitat and/or nest abandonment can result in lower reproductive success and lead to the further decrease in Greater Sage-Grouse populations. This management could allow for fewer disturbances to Greater Sage-Grouse, which can force Greater Sage-Grouse to move from high quality habitat to areas of lower quality, less desirable habitat.

Surface-disturbing and disruptive activities in mapped Greater Sage-Grouse winter concentration areas would be prohibited both inside and outside Greater Sage-Grouse priority habitat areas, as well as in connectivity areas. Management under Alternative B would protect the mapped winter concentration habitat and the Greater Sage-Grouse within the identified area throughout the year from habitat loss and would provide greater protection of habitat as compared to Alternative A. If any activity were to occur nearby the identified winter concentration areas, Greater Sage-Grouse could move to less desirable or lower quality sagebrush areas. Moving to lower quality sagebrush could result in lower calorie consumption and reduced health and vigor, making birds more susceptible to disease and predation.

Not allowing new surface occupancy on federal leases in Greater Sage-Grouse winter concentration areas within Greater Sage-Grouse priority habitats during any time of the year could prevent vegetation loss of critical winter habitat and would prevent disturbance to Greater Sage-Grouse from human presence or activity. Management under Alternative B would protect Greater Sage-Grouse winter concentration habitat in priority habitat throughout the year from habitat loss and would provide greater protection of habitat as compared to Alternative A. If any activity were to occur adjacent to winter concentration areas or in Greater Sage-Grouse general habitat, sage-grouse could move to less desirable or lower quality sagebrush areas. Moving to lower quality sagebrush could result in lower calorie consumption and reduced health and vigor, making birds more susceptible to disease and predation.

Limitations on noise would have similar impacts to Greater Sage-Grouse but on a larger scale covering the entire planning area, as compared to Alternative A.

The use of adaptive management to maintain at least 67% of the 2005-2008 Greater Sage-Grouse Core Area Population within the State of Wyoming would provide additional protection to sage-grouse populations within core and connectivity habitat if population numbers fell below the target percentage. Monitoring associated with the adaptive management would ensure that if populations were to decline, issues could be identified and corrective management could be implemented to protect and enhance existing population numbers.

Developing EIS/project level adaptive management strategies in support of the population management objectives for Greater Sage-Grouse set by the State of Wyoming (WY EO 2011-05) could provide additional protection though additional management for Greater Sage-Grouse and sagebrush habitat.

4.14.5 Alternative C

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

Impacts to Special Status Species from relocating existing designated ROW corridors would be the same as Alternative B. Impacts to Special Status Species from management of priority and general Greater Sage-Grouse habitat as ROW exclusion areas would be the same as Alternative A but it would protect 11,556,490 acres, all as exclusion areas, 11,270,560 acres more than under Alternative A. Amending ROWs to require features that enhance Greater Sage-Grouse habitat security (protective features) would be the same as Alternative A, but would apply to a greater area, providing more protection to Special Status Species. Maintenance and upgrades of existing structures in BLM ACECs and Forest Service Special Areas could result in short-term disturbance of Special Status Species from human and vehicle activity, but long-term impacts would be minimal.

Under Alternative C, wind development in Greater Sage-Grouse priority and general habitat would be excluded. Excluding 11,531,340 acres from wind energy development would protect Special Status Species habitat from surface disturbance, habitat loss, disturbance from human presence and activity, new road construction, the spread of invasive, non-native plant species, and the threats of collision mortality of birds and bats. Under Alternative C, 127 turbines could be developed. If wind development was allowed to occur (wind development in Greater Sage-Grouse priority and general habitat would be prohibited), locating wind energy development at least five miles from active Greater Sage-Grouse leks could reduce disturbance to Special Status Species which use lek habitat such as mountain plover, long-billed curlew or white-tailed prairie dog. Restrictions on MET towers would have the same impacts to Special Status Species as in Alternative A.

Prohibiting industrial solar projects in ACECs/SIAs and occupied Greater Sage-Grouse habitat would prevent the impacts to thousands of acres of Special Status Species habitat from vegetation removal, habitat loss, increased runoff and erosion, displacement, and the loss of contiguous, uninterrupted habitat.

Retaining public ownership of Greater Sage-Grouse priority habitat would ensure that management within these areas would protect sagebrush habitat with all of the BMPs and other designations, which could provide habitat protection for Special Status Species that inhabit these areas, and would provide greater protections than Alternative A. Impacts to Special Status Species would be the same as Alternative B.

Impacts to Special Status Species from acquisitions or conservation easements would be the same as Alternative B.

Acquiring important private lands would provide greater protection to Special Status Species within sagebrush habitat as compared to Alternative B.

Impacts to Special Status Species from not approving recommended withdrawal proposals unless the land management is consistent with Greater Sage-Grouse conservation measures could provide greater protection to sagebrush habitat and could provide habitat protection for Special Status Species that inhabit these areas, and could provide greater protection to functional habitat than Alternative A.

Prohibiting livestock grazing within Greater Sage-Grouse priority habitat (5,000,400 acres) would provide the greatest availability of habitat and forage for Special Status Species as compared to Alternative A, completely removing competition for resources with livestock.

Impacts would be the same as Alternative A for management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands, although it would occur only on Greater Sage-Grouse general habitat. In addition, Alternative C includes additional management for Greater Sage-Grouse habitat in general habitat by providing healthy, resilient, and recovering habitat components, which could provide sagebrush obligate and other Special Status Species additional habitat and forage within these areas.

Using ESD potential in Greater Sage-Grouse habitat to help protect against invasive, non-native plants could prevent the introduction and spread of invasive, non-native plant species which can alter or degrade the native landscape and force Special Status Species to move from high quality habitat to areas of lower quality, less desirable habitat. In areas without ESDs, Special Status Species habitat could benefit from the use of reference sites to identify appropriate vegetation communities and soil cover.

Impacts to Special Status Species habitat from reducing the procedures to retire grazing allotments would be the same as Alternative B. Impacts to Special Status Species habitat from the retirement of grazing privileges would be the same as Alternative A. Identifying specific allotment(s) where permanent retirement of grazing privileges is potentially beneficial to Greater Sage-Grouse would be the same as Alternative B.

Impacts to Special Status Species habitat from management for drought and other conditions in livestock allotments would be the same as Alternative A. Additional priority for Greater Sage-Grouse habitat during periods of drought could also be beneficial to Special Status Species which also use sagebrush habitat for forage of cover and would include a larger area of habitat than under Alternative B (priority and general Greater Sage-Grouse habitat).

Impacts to Special Status Species habitat from range improvement projects would be the same as described under Alternative B, but would apply to livestock grazing within Greater Sage-Grouse general habitat since priority habitat would be closed to grazing under Alternative C.

Impacts to Special Status Species habitat from current livestock trailing practices would be the same as Alternative A; in addition, avoiding grazing and trailing within lekking, nesting, brood-rearing, and winter habitats during periods of the year when these habitats are utilized by Greater Sage-Grouse could affect Special Status Species habitat by protecting it from the impacts described in Alternative A: loss of vegetation for forage and cover, soil compaction, erosion, trampling of vegetation and habitat, and the spread of invasive non-native plant species.

Impacts to Special Status Species habitat from riparian habitat management in Greater Sage-Grouse priority habitat would be the same as Alternatives A and B. In addition, Alternative C would provide additional habitat for Special Status Species with the requirement of at least six inches stubble height. This management could affect aquatic, riparian or wetland habitat by preventing streambank erosion or channel alteration, sedimentation, habitat loss, or the spread of invasive, non-native plant species (University of Idaho Stubble Height Review Team 2004). Hot season livestock grazing would not apply under Alternative C.

Impacts to Special Status Species from water developments would be the same as Alternative A. In addition, not authorizing new water developments in spring and seep habitat could protect sensitive spring and seep habitat from trampling from big game or livestock (in general habitat) surrounding the water development, could prevent breeding of mosquitoes and the possible spread of West Nile virus, and could prevent the introduction or spread of invasive non-native plant species.

Impacts to Special Status Species from modifying springs, seeps, and associated water developments to maintain the continuity of the predevelopment riparian area within Greater Sage-Grouse habitats would be the same as Alternative B. In addition, dismantling water developments could affect Special Status Species habitat by removing additional developed water sources and could protect sensitive spring and seep habitat from trampling from big game or livestock surrounding the water development.

Impacts to Special Status Species from not allowing any exceptions to lease stipulations, COAs, and T&Cs in Greater Sage-Grouse priority habitat would be the same as Alternative B, but would include Greater Sage-Grouse general habitat to affect more of the planning area.

Maximizing the avoidance of impacts from oil, gas, or geothermal activity could reduce habitat loss for Special Status Species and would allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects Special Status Species from human and other disturbance and is necessary for animals to breed, migrate, forage, seek cover, and complete their life histories. Oil, gas, and geothermal exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and the spread of invasive, non-native plant species, which can force special status wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future leases could occur under the other action alternatives.

Closing Greater Sage-Grouse priority and general habitat areas to fluid mineral leasing, 16,878,220 acres, would reduce habitat loss for Special Status Species and would allow for contiguous, uninterrupted habitat, and would close 16,006,440 more acres than Alternative A. Impacts to Special Status Species habitat would be the same as described under Alternative B. Under Alternative C, 11,126 wells are predicted to be developed, 5,284 fewer wells as compared to Alternative A. This alternative would allow for the greatest number of acres to be protected from habitat loss due to oil and gas development and could provide the largest protection of Special Status Species habitat as compared to Alternative A.

Not issuing new geophysical exploration permits within priority and general Greater Sage-Grouse habitat would prevent impacts to Special Status Species associated with geophysical exploration. Allowing exceptions for geophysical exploration would impact Special Status Species the same as described under Alternative A.

Impacts to Special Status Species from offsite mitigation would be the same as Alternative A. Applying COAs and mitigating or reducing the impact to Greater Sage-Grouse priority habitat during lease development would have impacts the same as those described under Alternative B.

Impacts to Special Status Species from not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat would be the same as Alternative B. Impacts to Special Status Species from completing Master Development Plans and requiring unitization within Greater Sage-Grouse priority habitat would be the same as Alternative B. Impacts to Special Status Species from requiring full reclamation bonds would be the same as Alternative B.

Prohibiting the construction of evaporation or infiltration reservoirs to hold coalbed methane wastewater would provide Special Status Species greater protection as compared to Alternative A. Not allowing construction of reservoirs could prevent impacts to Special Status Species from contact with highly alkaline wastewater with very high concentrations of salt (USFWS 2006b). Alternative C would remove the impacts from special status waterfowl entering the ponds and the threat of West Nile virus.

Exploring options to amend, cancel, or buy out leases in ACECs and Greater Sage-Grouse priority and general habitat would not have any impacts to Special Status Species habitat until leases were amended, canceled, or bought out.

Impacts to Special Status Species from coal leasing in lands outside of priority Greater Sage-Grouse habitat would be the same as Alternative B. Impacts to Special Status Species from not granting new underground mining leases, unless all surface disturbances (appurtenant facilities) are placed outside of the priority Greater Sage-Grouse habitat, would be the same as Alternative B.

Impacts to Special Status Species if all lands recommended for withdrawal from mineral entry within Greater Sage-Grouse priority habitat were withdrawn would be the same as Alternative B. Impacts to Special Status Species from 6,992,690 acres being closed to mineral material sales, exploration, and free use permits would be the same as Alternative B. Impacts to Special Status Species from restoring salable mineral pits within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to Special Status Species from allowing BLM SRPs and Forest Service RSUAs in priority Greater Sage-Grouse habitat would be the same as Alternative B.

Seasonally prohibiting camping and other non-motorized recreation within four miles of active Greater Sage-Grouse leks could protect Special Status Species within the buffer area from impacts of recreation use, such as displacement of Special Status Species from human and vehicle activities, damage or loss of habitat, spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species, or physiological stress from human presence during sensitive life stages.

Under Alternative C, Greater Sage-Grouse priority habitat areas and Audubon Important Bird Areas would be designated as Greater Sage-Grouse conservation ACECs/SIAs, 6,423,370 acres. Impacts from this management would be the same as Alternative B.

Impacts to Special Status Species from designating all OHV “open” areas within Greater Sage-Grouse priority habitat areas as limited to designated roads and trails (not including the sand dune portions of these areas) would be the same as Alternative B.

Impacts to Special Status Species from limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete would be the same as Alternative B. Prohibiting new road construction within four miles of the perimeter of active Greater Sage-Grouse leks would provide buffer distances for Special Status Species that use lek or sagebrush habitat from the presence of roads and the impacts of road construction. Road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Special status plant species could be damaged from vegetation loss or damage, erosion and soil loss, and the introduction and spread of invasive, non-native plant species. Human presence and vehicles may force Special Status Species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals, but these areas may be avoided by prey species which may move to less

desirable habitat to avoid predation. Avoiding new road construction in Greater Sage-Grouse priority and general habitat would impact Special Status Species as described above where roads were not constructed.

Impacts to Special Status Species habitat from not upgrading existing routes in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area. Impacts to Special Status Species from limiting route construction to realignments of existing routes in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area, 11,531,340 acres. In addition, mitigating any impacts to keep disturbance within 3% with methods that have been demonstrated to be effective to offset the loss of Greater Sage-Grouse habitat could benefit sagebrush obligate Special Status Species from additional loss of habitat, forage, and cover within these areas.

Impacts to Special Status Species from restoring roads or trails not designated in travel management plans within priority Greater Sage-Grouse habitat would be the same as Alternative B. Impacts to Special Status Species from reseeding closed roads or trails in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area. In addition, the use of native seed and transplanted sagebrush could provide additional forage and habitat for sagebrush obligate Special Status Species such as swift fox, pygmy rabbit, or Brewer's Sparrow.

Impacts to Special Status Species from not reducing sagebrush canopy cover to less than 15% during fuels treatment in Greater Sage-Grouse priority and general habitat, with some exceptions, would be the same as Alternative B, except it would apply to a larger area. Impacts to Special Status Species from the use of fuel breaks in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area. Alternative C would prioritize fire operations in priority habitat immediately after life and property; therefore, the potential for disturbance to special status wildlife within priority habitat is the same as Alternative B but less than Alternative B in general habitat. With regard to fuels management, Alternative C is more restrictive than Alternative B since all of the management actions fall within priority and general habitat; therefore, impacts from fuels management on special status wildlife species are expected to be less than Alternative B. Conversely, Alternative C does not offer as many protective management actions that could benefit special status wildlife as Alternatives B and D; therefore, it has more potential for habitat degradation than the other alternatives. However, the greatest amount of benefit under Alternative C would be provided to those species whose ranges overlap priority and general habitat. There is potential to negatively influence those Special Status Species that use other habitat types.

Impacts to Special Status Species from vegetation treatments in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area (priority and general habitat). Mitigating impacts using methods that have been demonstrated to be effective to offset the loss of Greater Sage-Grouse habitat could provide sagebrush habitat for Special Status Species. Impacts to Special Status Species from not allowing fuels treatments in known Greater Sage-Grouse winter range would be the same as Alternative B.

Avoiding (not conducting) sagebrush reduction/treatments to increase livestock or big game forage in Greater Sage-Grouse priority and general habitat, and including plans to restore high-quality habitat in areas where invasive species are present could affect Special Status Species differently. Some big game may not benefit from increases in sagebrush forage as much as sagebrush obligate Special Status Species, which could be affected by high quality sagebrush habitat for forage and cover. Impacts to Special Status Species from reclamation of Greater Sage-Grouse habitat in accordance to the Wyoming Reclamation Policy (2009a) would be the same as Alternative A.

Rehabilitating exotic seedings to recover sagebrush in areas to expand Greater Sage-Grouse priority and general habitat could provide Special Status Species habitat, forage, and cover within these areas within 15

to 25 years for sagebrush, but much shorter term for forbs and grasses. Initial treatments could cause displacement of Special Status Species from human and vehicle activities, which could move Special Status Species into less desirable habitat and could increase competition for available resources with other species and habitat uses. Treated areas are vulnerable to the introduction and spread of invasive, non-native plant species which could affect special status plants. Careful monitoring would be necessary to prevent or limit invasive, non-native plant species within the treated areas.

Impacts to Special Status Species from prioritizing restoration projects and the use and allocation of native seed within priority Greater Sage-Grouse habitat would be the same as Alternative B, but would also encompass Greater Sage-Grouse general habitat, a total of 11,531,340 acres.

Altering existing seedings of perennial grasses where appropriate to benefit Greater Sage-Grouse in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area (11,531,340 acres).

Impacts to Special Status Species from establishing seed harvest areas that are managed for seed production for fire prone areas would be the same as Alternative B.

Including pretreatment data on existing habitat conditions in plans for vegetation treatments would provide valuable data when conducting monitoring post-treatment and could lead to improved habitat conditions for treated areas. Resting treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Beck and Mitchell (2000) recommend that seeded areas should be rested at least two growing seasons or longer to prevent sagebrush seedlings from being trampled by livestock. Rested areas could provide Special Status Species with new vegetation for cover habitat and forage without competition with livestock during the rest period. Long-term monitoring of vegetation treatments can provide important data on post-revegetation conditions. Data collected could be used in future revegetation projects, could provide feedback on the success or needs for improving of the methods being used in revegetation efforts, and document when or if Greater Sage-Grouse return to the area.

Impacts to Special Status Species from the management of wild horses with the consideration of Greater Sage-Grouse populations would be the same as Alternative B.

Impacts to Special Status Species from conducting land health assessments for HMAs, and the management of wild horses in priority Greater Sage-Grouse habitat would be the same as Alternative B.

Impacts to Special Status Species from designing and implementing fuels treatments, the use of prescribed fire, and post fuels management in Greater Sage-Grouse priority and general habitat would be the same as Alternative B (5,000,400 acres), except the management would apply to a larger area (11,531,340 acres).

Within Greater Sage-Grouse priority and general habitat, managing lands to be in the good or better ecological condition to help minimize adverse impacts of fire could provide vital habitat components for Special Status Species. Minimizing the impacts of fire could provide protection of sagebrush habitat, which can take up to 40 years to recover from fire. Managing lands to be in the good or better ecological condition could prevent the introduction or spread of invasive, non-native plant species prior to or following catastrophic fire events.

Fuels treatments that focus on interfaces with human habitation or significant existing disturbances within Greater Sage-Grouse priority and general habitat, could reduce impacts of fuels treatments in other habitat where Special Status Species are more likely to be found. Interfaces with human habitation are not ideal habitat for most Special Status Species, effects to Special Status Species from vegetation removal, surface

disturbance, and the presence of humans, vehicles, and equipment could be lower than in areas a mile or more away from human habitation.

Establishing adequately sized exclosures (free of livestock grazing) for post fire recovery that can be used to assess recovery within Greater Sage-Grouse priority and general habitat could protect recovering habitat from livestock grazing while vegetation is re-establishing. Allowing vegetation to become re-established without livestock could allow for faster habitat recovery and provide a baseline of how the treated area recovers compared to areas within Greater Sage-Grouse general habitat where grazing occurs. Allowing vegetation to recover could provide habitat and forage for Special Status Species without the competition from livestock.

Excluding or closing areas within Greater Sage-Grouse priority and general habitat from livestock grazing after prescribed burns could allow treated areas to revegetate, soils to stabilize, and until woody and herbaceous plants achieve Greater Sage-Grouse habitat objectives would be beneficial to Special Status Species and sagebrush habitat recovery. Resting or closing treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Beck and Mitchell (2000) recommend that seeded areas should be rested at least two growing seasons or longer to prevent sagebrush seedlings from being trampled by livestock.

Mowing of grass in any fuels reduction project (roadsides or other areas) Greater Sage-Grouse priority and general habitat could reduce total loss of sagebrush habitat from common fuelbreak techniques, which can include bulldozing fire lines. Mowed areas still retain seeds and rooted plants that could grow back over time, returning habitat to the area. The disturbance could still fragment habitat and cause Special Status Species to abandon the area.

Impacts to Special Status Species from using fire suppression to protect Greater Sage-Grouse priority and general habitat would be the same as Alternative B.

Impacts to Special Status Species from managing the level of density of disturbance within Greater Sage-Grouse connectivity habitat would be the same as Alternative B.

Impacts to Special Status Species from a 3% limit of disturbance per section (640 acres) when permitting APDs on existing leases within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to Special Status Species from not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat and connectivity habitat areas would be the same as Alternative B.

Impacts to Special Status Species habitat from restrictions on exploratory drilling that prohibits surface disturbing activity and related activities that are disruptive to Greater Sage-Grouse, including vehicle traffic and other human presence during nesting and early brood-rearing season in Greater Sage-Grouse priority, general and connectivity habitat could be reduced as compared to Alternative A. Alternative C could allow more contiguous, uninterrupted habitat which could buffer Special Status Species from human and other disturbance and is necessary for Special Status Species to breed, migrate, forage, seek cover, and complete their life histories.

Impacts to Special Status Species from conservation measures within Greater Sage-Grouse winter concentration areas would be the same as Alternative B.

Impacts to Special Status Species habitat from limiting noise would be the same as Alternative B.

Impacts to Special Status Species habitat from the use of adaptive management would be the same as Alternative B.

Greater Sage-Grouse–Alternative C

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

Impacts to Greater Sage-Grouse from relocating existing designated ROW corridors would be the same as Alternative B. Greater Sage-Grouse priority and general habitat would be managed as ROW exclusion areas, preventing development of ROWs within 11,556,490 acres, 11,270,560 more acres than under Alternative A. Impacts to Greater Sage-Grouse from ROW exclusion areas would be the same as described Alternative B; however, those impacts would apply to a much larger area. Amending ROWs to require features that enhance Greater Sage-Grouse habitat security (protective features) would be the same as Alternative A, but would apply to a greater area, providing more protection to Greater Sage-Grouse. Maintenance and upgrades of existing structures in BLM ACECs and Forest Service Special Areas could result in short-term disturbance of Greater Sage-Grouse from human and vehicle presence.

Under Alternative C, wind development in Greater Sage-Grouse priority and general habitat would be excluded. Excluding 11,531,340 acres from wind energy development would protect Greater Sage-Grouse habitat from surface disturbance, habitat loss, disturbance from human presence and activity, new road construction, the spread of invasive, non-native plant species, and the threats of collision mortality of birds and bats. Under Alternative C, 127 turbines could be developed. Impacts to Greater Sage-Grouse outside of general and priority habitat could occur, but not to the extent as within priority and general habitat, described in Alternative A. Where wind development did occur, locating wind energy development at least five miles from active Greater Sage-Grouse leks could reduce disturbance to Greater Sage-Grouse by providing an adequate buffer distance to prevent eventual abandonment of lek habitat. This buffer distance would reduce the impacts to Greater Sage-Grouse from perceived or actual overhead predation and the risk of collisions with wind turbines, power lines, or other related infrastructure. Restrictions on MET towers would have the same impacts to Greater Sage-Grouse as in Alternative A.

Prohibiting industrial solar projects in ACECs and occupied Greater Sage-Grouse habitat would prevent the impacts to thousands of acres of habitat from vegetation removal, habitat loss, the loss of contiguous, uninterrupted habitat, predation, and displacement of grouse.

Retaining public ownership of Greater Sage-Grouse priority habitat would ensure that management within these areas would protect sagebrush habitat with all of the BMPs and other designations, which could provide protection for Greater Sage-Grouse which inhabit these areas, and would provide greater protections than Alternative A. Impacts to Greater Sage-Grouse would be the same as Alternative B.

Impacts to Greater Sage-Grouse from acquisitions or conservation easements would be the same as Alternative B. Acquiring important private lands for possible expansion of ACECs and Forest Service Sage-Grouse Special Areas would provide greater protection to Greater Sage-Grouse from special management for the sagebrush habitat and Greater Sage-Grouse, as compared to Alternative B. Impacts to Greater Sage-Grouse from not approving recommended withdrawal proposals unless the land management is consistent with Greater Sage-Grouse conservation measures could provide focused protection of sagebrush habitat in areas where management for Greater Sage-Grouse and sagebrush habitat would be most effective.

Prohibiting livestock grazing within Greater Sage-Grouse priority habitat (5,000,400 acres) could reduce the impacts of livestock grazing on sensitive lekking, nesting, and early brood-rearing habitat, could reduce the threats of habitat loss or damage from overgrazing, could improve the health of vigor of late brood-rearing habitats where vegetation objectives are not being met, and could prevent the introduction or spread

of invasive, non-native plant species. Alternative C would provide the greatest protection to Greater Sage-Grouse habitats from the impacts of livestock grazing.

Impacts would be the same as Alternative A for management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands although it would occur only on Greater Sage-Grouse general habitat. In addition, Alternative C includes additional management for ESD in sage-grouse general habitat to provide for healthy, resilient, and recovering Greater Sage-Grouse habitat components which could provide a greater balance of livestock grazing practices within Greater Sage-Grouse habitat.

Managing livestock grazing to achieve ESD potential vegetation communities could help to prevent the introduction and spread of invasive, non-native plant species, which can alter or degrade native landscapes and lead to habitat fragmentation as habitats are converted to invasive species. In areas without ESDs, grazing management to achieve vegetation objectives based on the use of reference sites could benefit sage-grouse habitats.

In the Pinedale Field Office, eliminating livestock grazing from sage-grouse priority would close all or portions of 130 grazing allotments (approximately 719,000 acres). Impacts of removing livestock from these allotments would be similar to those that would occur in allotments where grazing management changes are made in Alternative A or impacts of reducing livestock grazing to 20-30% of permitted use in Alternative B. Changes in vegetation would occur over a larger land area than for either Alternative A or B. Changes in upland plant community composition would be slow and might not be measureable for years or decades; however, increased vigor of plants already present would result in a shorter time frame. Because larger landscapes tend to respond to changes in grazing management more quickly than small areas or exclosures (Anderson and Inouye 2001, Davies et al. 2014, Holechek et al. 1999, Laycock 1967, McLean and Tisdale 1972, Pyke 2011), changes in vegetation composition might be more likely or more rapid under this alternative; however, changes still might take years or decades to become observable or measureable.

Impacts to Greater Sage-Grouse and sagebrush habitat from reducing the procedures to retire grazing allotments would be the same as Alternative B. Impacts to Greater Sage-Grouse habitat from the retirement of grazing privileges would be the same as Alternative A. Identifying specific allotment(s) where permanent retirement of grazing privileges is potentially beneficial to Greater Sage-Grouse would be the same as Alternative B. Impacts to Greater Sage-Grouse from management for drought and other conditions in livestock allotments would be the same as Alternative A. Additional priority for Greater Sage-Grouse habitat during periods of drought would be the same as Alternative B, but would apply to general as well as priority Greater Sage-Grouse habitat.

Impacts to Greater Sage-Grouse from range improvement projects would be the same as described under Alternative B, but would apply to livestock grazing within Greater Sage-Grouse general habitat since priority habitat would be closed to grazing under Alternative C. Impacts to Greater Sage-Grouse from current livestock trailing practices would be the same as Alternative A; in addition, avoiding grazing and trailing within lekking, nesting, brood-rearing, and winter habitats during periods of the year when these habitats are utilized by sage-grouse would prevent disturbance and possible habitat abandonment by grouse during sensitive periods of their life cycle. This management could prevent further losses of Greater Sage-Grouse from lack of breeding, loss of chicks, stress from fleeing or habitat abandonment, or starvation from inadequate forage sources.

Impacts to Greater Sage-Grouse from riparian habitat management in Greater Sage-Grouse priority habitat would be the same as Alternatives A and B. In addition, Alternative C would provide additional habitat for Greater Sage-Grouse with the requirement of at least six inches stubble height. This management could affect aquatic, riparian or wetland habitat by preventing streambank erosion or channel alteration, habitat loss, or the spread of invasive, non-native plant species (University of Idaho Stubble Height Review Team

2004). Clary and Leininger (2000), recommend at least four inches of residual stubble as a starting point for riparian habitat management. This management could provide forage for grouse in important late brood-rearing habitat. Hot season livestock grazing would not apply under Alternative C.

Impacts to Greater Sage-Grouse from water developments would be the same as Alternative A. In addition, not authorizing new water developments in spring and seep habitat would protect important areas used by Greater Sage-Grouse for foraging (Connelly et al. 2000). This management could protect sensitive spring and seep habitat from trampling from wildlife or livestock (in general habitat) surrounding the water development, could prevent breeding of mosquitoes and the possible spread of West Nile virus, and could prevent the introduction or spread of invasive non-native plant species.

Impacts to Greater Sage-Grouse from modifying springs, seeps, and associated water developments to maintain the continuity of the predevelopment riparian area within Greater Sage-Grouse habitats would be the same as Alternative B. In addition, dismantling water developments in wet meadows and riparian areas would provide habitat protection of important summer-late brood-rearing habitat and habitat critical to Greater Sage-Grouse for late-growing season foraging (Crawford et al. 2004). Removing water developments could protect sensitive spring and seep habitat from trampling from wildlife or livestock surrounding the water development.

Impacts to Greater Sage-Grouse from not allowing any exceptions to lease stipulations, COAs, and T&Cs in Greater Sage-Grouse priority habitat would be the same as Alternative B, but would include Greater Sage-Grouse general habitat to affect more of the planning area.

Maximizing the avoidance of impacts from oil, gas, or geothermal activity could reduce habitat loss and fragmentation and would allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects Greater Sage-Grouse from human and other disturbance and is necessary for grouse to breed, migrate, forage, seek cover, and complete their life histories. Oil, gas, and geothermal exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force Greater Sage-Grouse to abandon habitat and relocate to areas with less disturbance. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil, gas, or geothermal development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future leases could occur under the other action alternatives.

Closing Greater Sage-Grouse priority and general habitat areas to fluid mineral leasing, 16,878,220 acres, would reduce habitat loss for Greater Sage-Grouse and would allow for contiguous, uninterrupted habitat, and would close 16,006,440 more acres than Alternative A. Impacts to Greater Sage-Grouse would be the same as described under Alternative B. Under Alternative C, 11,126 oil, gas, and CBNG wells are predicted to be developed, 5,285 fewer wells as compared to Alternative A. This alternative would allow for the greatest number of acres to be protected from habitat loss due to oil and gas development and could provide the largest protection of Greater Sage-Grouse habitat as compared to Alternative A.

Not issuing new geophysical exploration permits within priority and general Greater Sage-Grouse habitat would prevent impacts to Greater Sage-Grouse associated with geophysical exploration. Allowing exceptions for geophysical exploration would impact Greater Sage-Grouse the same as described under Alternative A.

Impacts to Greater Sage-Grouse from offsite mitigation would be the same as Alternative A. Applying COAs and mitigating or reducing the impact to Greater Sage-Grouse priority habitat during lease development would have impacts, the same as described under Alternative B. Impacts to Greater Sage-

Grouse from not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to Greater Sage-Grouse from completing Master Development Plans and requiring unitization within Greater Sage-Grouse priority habitat would be the same as Alternative B. Impacts to Greater Sage-Grouse from requiring full reclamation bonds would be the same as Alternative B.

Prohibiting the construction of evaporation or infiltration reservoirs to hold coalbed methane wastewater could prevent impacts to Greater Sage-Grouse from the spread of West Nile virus.

Impacts to Greater Sage-Grouse from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative B.

Exploring options to amend, cancel, or buy out leases in ACECs and Greater Sage-Grouse priority and general habitat would not have any impacts to Greater Sage-Grouse until leases were amended, canceled, or bought out.

Impacts to Greater Sage-Grouse from coal leasing in lands outside of priority Greater Sage-Grouse habitat would be the same as Alternative B. Impacts to Greater Sage-Grouse from granting no new underground mining leases unless all surface disturbances (appurtenant facilities) are placed outside of the priority Greater Sage-Grouse habitat would be the same as Alternative B.

Impacts to Greater Sage-Grouse if all lands recommended for withdrawal from mineral entry within Greater Sage-Grouse priority habitat were withdrawn would be the same as Alternative B. Impacts to Greater Sage-Grouse from 6,992,690 acres being closed to mineral material sales, exploration, and free use permits would be the same as Alternative B. Impacts to Greater Sage-Grouse from restoring salable mineral pits within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to Greater Sage-Grouse from allowing BLM SRPs and Forest Service RSUAs in priority Greater Sage-Grouse habitat would be the same as Alternative B.

Seasonally prohibiting camping and other non-motorized recreation within four miles of active Greater Sage-Grouse leks could prevent disturbance from noise or human presence to Greater Sage-Grouse during lekking and nesting. Preventing disturbance of lekking or nesting could reduce stress to grouse from human presence, prevent nest abandonment, prevent interruption of lekking activities, prevent the spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species, or physiological stress from human presence during sensitive life stages.

Under Alternative C, Greater Sage-Grouse priority habitat areas and Audubon Important Bird Areas would be designated as Greater Sage-Grouse conservation ACECs/SIAs, 6,423,370 acres. Impacts from this management would be the same as Alternative B.

Impacts to Greater Sage-Grouse from designating all OHV “open” areas within Greater Sage-Grouse priority habitat areas as limited to designated roads and trails (not including the sand dune portions of these areas) would be the same as Alternative B.

Impacts to Greater Sage-Grouse from limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete would be the same as Alternative B. Prohibiting new road construction within four miles of the perimeter of active Greater Sage-Grouse leks would help reduce habitat fragmentation around leks. Buffers around leks can provide undisturbed corridors for females to move from the lek to nesting areas. Areas of habitat connectivity are

imperative for Greater Sage-Grouse survival. Walker et al. (2007) recommends large areas with extensive stands of sagebrush of approximately four or more miles around leks to allow breeding populations of Greater Sage-Grouse to return to the lek. The availability of large, uninterrupted areas of sagebrush habitat for sage-grouse to forage and nest is likely to influence the size of the breeding populations and persistence of leks (Swenson et al. 1987, Ellis et al. 1989, Schroeder et al. 1999, Leonard et al. 2000, Smith et al. 2005). Prohibiting road construction in these areas will help reduce vehicle collisions with grouse, and help prevent the introduction or spread of invasive, non-native plant species. Road corridors are desirable hunting areas for predatory animals; the buffer areas would reduce the threat of predation on Greater Sage-Grouse. Avoiding new road construction in Greater Sage-Grouse priority and general habitat would impact Greater Sage-Grouse as described above where roads were not constructed.

Impacts to Greater Sage-Grouse from not upgrading existing routes in Greater Sage-Grouse priority and general habitat would be the same as Alternative B. Mitigating impacts using methods that have been demonstrated to be effective to offset the loss of Greater Sage-Grouse habitat could provide sagebrush habitat for future use by Greater Sage-Grouse. Impacts to Greater Sage-Grouse from limiting route construction to realignments of existing routes in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area, 11,531,340 acres compared to 5,000,400 acres in Alternative B. Mitigating impacts using methods that have been demonstrated to be effective to offset the loss of Greater Sage-Grouse habitat could provide sagebrush habitat for future use by Greater Sage-Grouse.

Impacts to Greater Sage-Grouse from restoring roads or trails not designated in travel management plans within priority Greater Sage-Grouse habitat would be the same as Alternative B. Impacts to Greater Sage-Grouse from reseeding closed roads or trails in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area (priority and general habitat). In addition, the use of native seed and transplanted sagebrush could provide additional forage and habitat could restore important habitat components for Greater Sage-Grouse.

Impacts to Greater Sage-Grouse from not reducing sagebrush canopy cover to less than 15% during fuels treatment in Greater Sage-Grouse priority and general habitat, with some exceptions, would be the same as Alternative B, except it would apply to a larger area (priority and general). Impacts to Greater Sage-Grouse habitat from the use of fuel breaks in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area (priority and general habitat).

Impacts to Greater Sage-Grouse from vegetation treatments in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area (priority and general habitat). Mitigating impacts using methods that have been demonstrated to be effective to offset the loss of Greater Sage-Grouse habitat could provide sagebrush habitat for future use by Greater Sage-Grouse. Impacts to Greater Sage-Grouse from not allowing fuels treatments in known Greater Sage-Grouse winter range would be the same as Alternative B.

Avoiding (not conducting) sagebrush reduction/treatments to increase livestock or big game forage in Greater Sage-Grouse priority and general habitat would protect sagebrush habitat from removal or reduction of priority habitat components critical for Greater Sage-Grouse forage, cover, or breeding. Many scientific studies do not recommend sagebrush treatments for forage increase due to the likelihood of impacts to Greater Sage-Grouse from habitat loss and abandonment of habitat post-treatment (Beck and Mitchell 2000, Cagney et al. 2010, Connelly et al. 2000). Impacts to Greater Sage-Grouse from habitat reclamation in accordance to the Wyoming Reclamation Policy (2009a) would be the same as Alternative A.

Rehabilitating exotic seedings to recover sagebrush in areas to expand Greater Sage-Grouse priority and general habitat could provide Greater Sage-Grouse habitat, forage, and cover within these areas within 15

to 25 years for sagebrush, but much shorter term for forbs and grasses. Initial treatments could cause displacement of Greater Sage-Grouse from human and vehicle activities which could move grouse into less desirable habitat and could increase competition for available resources with other species and habitat uses. Treated areas are vulnerable to the introduction and spread of invasive, non-native plant species. Careful monitoring would be necessary to prevent or limit invasive, non-native plant species within the treated areas.

Impacts to Greater Sage-Grouse from prioritizing restoration projects and the use and allocation of native seed within priority Greater Sage-Grouse habitat would be the same as Alternative B, but would also encompass Greater Sage-Grouse general habitat, a total of 11,531,340 acres. Altering existing seedings of perennial grasses where appropriate to benefit Greater Sage-Grouse in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area (11,531,340 acres). Impacts to Greater Sage-Grouse from establishing seed harvest areas that are managed for seed production for fire prone areas would be the same as Alternative B.

Including pretreatment data on existing habitat conditions in plans for vegetation treatments would provide valuable data when conducting monitoring post-treatment and could lead to improved habitat conditions for treated areas. Resting treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Beck and Mitchell (2000) recommend that seeded areas should be rested at least two growing seasons or longer to prevent sagebrush seedlings from being trampled by livestock. Rested areas could provide Greater Sage-Grouse with new vegetation for cover habitat and forage without competition with livestock during the rest period. Long-term monitoring of vegetation treatments can provide important data on post-revegetation conditions. Data collected could be used in future revegetation projects, could provide feedback on the success or needs for improving of the methods being used in revegetation efforts, and document when or if Greater Sage-Grouse returned to the area.

Impacts to Greater Sage-Grouse from the management of wild horses with the consideration of Greater Sage-Grouse populations would be the same as Alternative B. Impacts to Greater Sage-Grouse from conducting land health assessments for HMAs, and the management of wild horses in priority Greater Sage-Grouse habitat would be the same as Alternative B.

Impacts to Greater Sage-Grouse from designing and implementing fuels treatments, the use of prescribed fire, and post fuels management in Greater Sage-Grouse priority and general habitat would be the same as Alternative B (5,000,400 acres), except the management would apply to a larger area (11,531,340 acres). Within Greater Sage-Grouse priority and general habitat, managing lands to be in the good or better ecological condition to help minimize adverse impacts of fire could provide vital habitat components for sage-grouse forage or cover. Minimizing the impacts of fire could provide protection of sagebrush habitat which can take up to 40 years to recover from fire. Managing lands to be in the good or better ecological condition could prevent the introduction or spread of invasive, non-native plant species prior to or following catastrophic fire events.

Fuels treatments that focus on interfaces with human habitation or significant existing disturbances within Greater Sage-Grouse priority and general habitat, could reduce impacts of fuels treatments in other habitat where Greater Sage-Grouse are more likely to be found. Fuels treatments resulting in vegetation removal, surface disturbance, and the presence of humans, vehicles and equipment may cause less disturbance to sage-grouse in areas of human habitation interfaces than if treatments were to occur in more remote habitat.

Establishing adequately sized exclosures (free of livestock grazing) for post fire recovery that can be used to assess recovery within Greater Sage-Grouse priority and general habitat could protect recovering habitat

from livestock grazing while vegetation is re-establishing. Allowing vegetation to become re-established without livestock could allow for faster habitat recovery and provide a baseline of how the treated area recovers compared to areas within Greater Sage-Grouse general habitat where grazing occurs.

Excluding or closing areas within Greater Sage-Grouse priority and general habitat from livestock grazing after prescribed burns could allow treated areas to revegetate, soils to stabilize, and until woody and herbaceous plants achieve Greater Sage-Grouse habitat objectives would be beneficial to Greater Sage-Grouse and sagebrush habitat recovery. Resting or closing treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Beck and Mitchell (2000) recommend that seeded areas should be rested at least two growing seasons or longer to prevent sagebrush seedlings from being trampled by livestock.

Mowing of grass in any fuelbreak fuels reduction project (roadsides or other areas) Greater Sage-Grouse priority and general habitat could reduce total loss of sagebrush habitat from common fuelbreak techniques, which can include bulldozing fire lines. Mowed areas still retain seeds and rooted plants which could grow back over time, returning habitat to the area. The disturbance could still fragment habitat and cause Greater Sage-Grouse to abandon the area.

Impacts to Greater Sage-Grouse from using fire suppression to protect Greater Sage-Grouse priority and general habitat would be the same as Alternative B.

Impacts to Greater Sage-Grouse from managing the level of density of disturbance within Greater Sage-Grouse connectivity habitat would be the same as Alternative B. Impacts to Greater Sage-Grouse from a 3% limit of disturbance per section (640 acres) when permitting APDs on existing leases within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to Greater Sage-Grouse from not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat and connectivity habitat areas would be the same as Alternative B. Impacts to Greater Sage-Grouse habitat from restrictions on exploratory drilling that prohibits surface disturbing activity and related activities that are disruptive to Greater Sage-Grouse, including vehicle traffic and other human presence during nesting and early brood-rearing season in Greater Sage-Grouse priority, general and connectivity habitat could be reduced as compared to Alternative A. Alternative C could allow more contiguous, uninterrupted habitat, which could buffer Greater Sage-Grouse from human and other disturbance and is necessary for sage-grouse to breed, migrate, forage, seek cover, and complete their life histories. Impacts to Greater Sage-Grouse from conservation measures within Greater Sage-Grouse winter concentration areas would be the same as Alternative B. Impacts to Greater Sage-Grouse habitat from limiting noise would be the same as Alternative B.

Impacts to Greater Sage-Grouse from the use of adaptive management would be the same as Alternative B.

4.14.6 Alternative D

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

The impacts on Special Status Species resulting from restricting utility structures within Greater Sage-Grouse core and connectivity habitat areas would be similar to those identified in Alternative A, except new transmission projects would be allowed only within a designated two-mile wide transmission corridor and within 0.5 miles either side of existing 115kV or larger transmission lines. Impacts to Special Status Species habitat from new construction within existing ROWs could have impacts to vegetation within the ROW corridors where the land within a two-mile wide pathway may have been previously disturbed from

prior facility construction. Special status species that use early successional habitat such as mountain plover, long-billed curlew, or white-tailed prairie dog could be impacted by development within an existing corridor. Construction activities could disturb other nearby Special Status Species causing species to vacate the area and move to lower quality habitat. Moving from desirable habitat can result in stress, mortality or lower reproductive rates and offspring survival. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. New utility towers could provide perch sites for raptors and other bird species, but power lines may also cause mortality to bats or birds from collisions or electrocution.

If construction of new ROW corridors were to occur, the resulting fragmentation of formerly intact habitat could affect Special Status Species populations by severing migration routes to seasonal habitat areas and parturition habitat. New projects would have seasonal stipulations that would help prevent disturbance to Special Status Species during those timeframes. Management for construction would consider impacts to Greater Sage-Grouse populations and be designed to minimize impacts through project design and mitigation. The considerations could reduce the impacts from disturbance and habitat loss by habitat avoidance or timing of construction. Surface disturbance from construction of new ROWs would remove vegetation resulting in fragmentation of formerly intact habitat. Fragmenting habitat could affect Special Status Species populations by severing migration routes or forcing Special Status Species away from areas of early seral growth. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided which could affect special status plant species.

Impacts to Special Status Species from managing 5,230,110 acres of ROW exclusion areas within Greater Sage-Grouse core and connectivity habitat would be the same as Alternative B; however, the density of disturbance limit for this alternative is 9%, allowing greater disturbance of habitat from development activities before mitigation would be made necessary.

Allowing Greater Sage-Grouse general habitat to be available for new ROWs or SUAs subject to BMPs, with 1,300,510 acres of avoidance areas (1,159,830 fewer acres than Alternative A) could impact Special Status Species from direct habitat loss and fragmentation of habitat. If construction of new ROW corridors were to occur, the resulting fragmentation of formerly intact habitat could affect Special Status Species populations by severing migration routes and loss of habitat. Disturbed areas would be more vulnerable to invasion or spread of non-native plant species and diminish habitat function, can out compete with native forage, and prevent the area from restoring with special status, native or desirable plant species. New utility towers could provide perch sites for raptors and other bird species, but power lines may also cause mortality to bats or birds from collisions or electrocution. Some smaller prey species will avoid and abandon areas where overhead structures are present, such as power lines and towers, due to the increased risk of avian predators. However, overhead structures could provide perches for hunting raptors or other predatory birds.

Maintenance and upgrades of existing structures could result in short-term disturbance of Special Status Species from human and vehicle activity, but long-term impacts would be minimal.

Impacts to Special Status Species from the development of wind energy would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,608,420 acres (Map 2-32), which would reduce the level of wind energy development and related impacts on Special Status Species. As a result of these restrictions, 980 turbines are expected to be developed, 274 fewer than under Alternative A. The development of wind energy could cause habitat loss, and both short and long-term impacts to special status wildlife or plants. Large wind energy fields also involve surface disturbance, which could permanently change the habitat structure, affecting special status wildlife or plants. Disturbance during installation of towers, roads, and infrastructure could force special status wildlife away from habitat. Some smaller prey species will avoid and abandon areas where overhead structures are present, such as power

lines and towers, due to the increased risk of avian predators. However, overhead structures could provide perches for hunting raptors or other predatory birds. These impacts would occur under Alternative D in Greater Sage-Grouse general habitat but to a lesser degree than under Alternative A, due to the reduced number of turbines projected to be developed.

Restrictions on MET towers would have the same impacts to Special Status Species as in Alternative A.

Retaining ownership of Greater Sage-Grouse core and connectivity habitat unless other economic or other benefits are determined would affect Special Status Species the same as under Alternative B, unless the parcel was not retained. Impacts to Special Status Species from disposal of core and connectivity habitat would depend on which agency or party acquired the land and the type of management was planned for the parcel.

Impacts to Special Status Species from acquisitions or conservation easements would be the same as Alternative A.

Acquiring lands based on a variety of economic resource criteria could have limited effects to Special Status Species depending on the lands acquired or exchanged.

Impacts to Special Status Species from livestock grazing management would be the same as Alternative A.

Working cooperatively with permittees, leasees, and other landowners to develop grazing management strategies on an allotment-by-allotment basis to improve Greater Sage-Grouse habitat could affect Special Status Species from possible habitat improvement. The BLM would include specific objectives to maintain sage-grouse habitat and would adjust the permit lease if the specified standards/objectives were not being met within the allotment. This would help ensure that livestock grazing is managed in a manner that considers the overall health and function of sage-grouse habitat.

Impacts to Special Status Species from adjusting livestock grazing management would be the same as Alternative A.

Impacts to Special Status Species from livestock grazing permit renewals would be the same as Alternative A. In addition, within Greater Sage-Grouse core and connectivity habitat, incorporating site specific sage-grouse habitat objectives could provide habitat components or a greater focus on sagebrush habitat within grazing allotments that could provide improved habitat for Special Status Species.

Impacts to Special Status Species from developing conservation plans to meet seasonal Greater Sage-Grouse habitat requirements in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative A.

Impacts to Special Status Species from authorizing retirement of grazing allotments in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative A, although under Alternative D, a limit of 15% of a planning unit would constrain how much land could be retired or rested. Temporary use of retired allotments to rest other allotments could allow sagebrush habitat in those rested allotments time to restore and provide greater habitat and forage values for Special Status Species.

Impacts to Special Status Species from considering drought conditions in livestock grazing management would be the same as Alternative A.

Impacts to Special Status Species from evaluating range improvements would be the same as Alternative B, but would also apply to Greater Sage-Grouse general habitat as well as core and connectivity/priority habitat.

Impacts to Special Status Species from livestock trailing management would be the same as Alternative A.

Impacts to Special Status Species from riparian area management would be the same as Alternative B.

Impacts to Special Status Species from water developments would be the same as Alternative A, but would apply to the entire planning area.

Impacts to Special Status Species from exceptions to lease stipulations, COAs, and T&Cs would be the same as Alternative A.

Under Alternative D, 964,860 acres would be closed to oil and gas leasing, 93,080 more acres as compared to Alternative A; and 15,769 wells are predicted to be developed, 642 fewer wells than under Alternative A. Impacts to Special Status Species would be similar to Alternative A, but would occur within fewer acres, reducing impacts from habitat fragmentation, habitat loss, vegetation removal, soil loss and erosion, noise, human disturbance, or the introduction of invasive, non-native plant species such as cheatgrass, which can alter the composition of native species, and lead to the loss of forage and cover for Special Status Species.

Impacts to Special Status Species from geophysical operations would be the same as Alternative A.

Impacts to Special Status Species from offsite mitigation would be the same as Alternative A. Impacts to Special Status Species from working with proponents holding valid existing leases would be the same as Alternative B.

Impacts to Special Status Species from working with project proponents (including those within BLM/Forest Service) to site their projects in locations that minimize impacts to sensitive resources would be the same as Alternative A.

Impacts to Special Status Species from using unitization would be the same as Alternative B.

Impacts to Special Status Species from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative A.

Impacts to Special Status Species from coal lease development and exploration would be the same as Alternative A. Under Alternative D, 261,000 acres would be closed to non-energy, solid leasable mineral leasing, the same as Alternative A. In addition, mitigation measures in project planning could provide some type of protection to sagebrush habitat or Special Status Species. Possible measures could reduce initial disturbance, provide rehabilitation of sites, and/or create other areas sagebrush habitat. Allowing projects that meet compliance of surface occupancy and disturbance and density stipulations could reduce fragmentation of habitat, and may reduce other impacts from surface disturbance or habitat fragmentation from using existing infrastructure.

Impacts to Special Status Species from locatable and salable mineral activities would be the same as Alternative A and 1,892,620 acres would be closed (withdrawn) for locatable minerals and 472,800 acres would be closed for salable minerals, the same as Alternative A. Impacts to Special Status Species from salable mineral pits would be the same as Alternative A.

Impacts to Special Status Species from approving BLM SRPs and Forest Service RSUAs would be the same as Alternative A.

Impacts to Special Status Species from managing open OHV areas would be the same as Alternative A.

Impacts to Special Status Species from limiting motorized travel to existing roads and trails would be the same as Alternative A.

New road construction would avoid areas within 0.25 miles of the perimeter of occupied Greater Sage-Grouse leks within Greater Sage-Grouse core and connectivity habitat, the same as Alternative A. The management would provide minimal buffer distances for Special Status Species that use lek or sagebrush habitat such as swift fox, long-billed curlew, mountain plover, and burrowing owl from the presence and construction activities of roads. This alternative provides the smallest buffer distance and the least protection of the action alternatives to Special Status Species from the impacts from the building and presence of roads within Greater Sage-Grouse lek habitat. Road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Human presence and vehicles may force Special Status Species away from desired habitat to lower quality, less desirable habitat. Collisions of Special Status Species with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals to hunt, such as ferruginous hawk and swift fox, but these areas may be avoided by prey species, such as pygmy rabbit or white-tailed prairie dog, which may move to less desirable habitat to avoid predation.

Impacts to Special Status Species from upgrading roads would be the same as Alternative A.

Allowing natural deterioration of roads not designated in travel management plans within Greater Sage-Grouse core and general habitat could prevent effects from short-term impacts during reclamation efforts, such as displacement from human and vehicle activities, which could move Special Status Species into less desirable habitat and could increase competition for available resources with other species and uses. Vehicle routes are vulnerable to invasion of noxious weeds which could spread during the natural deterioration of the road.

Natural reseeding within Greater Sage-Grouse core, connectivity, and general habitat would allow for succession of native plant species to revegetate undesignated roads or routes. In Greater Sage-Grouse core and general habitat, many areas would naturally reseed with Wyoming big sagebrush, or other sagebrush species, and associated forbs and grasses. Natural reseeding could be effective if there is enough precipitation to allow germination of the seedbank, and the area is not already dominated by invasive, non-native plant species (WGFD 2010, Lambert 2005). Special status species could benefit long-term from the regrowth of sagebrush habitat for habitat and forage.

Within Greater Sage-Grouse core and connectivity habitat, managing for vegetation composition and structure that reflects the desired plant community or comparable standard would affect Special Status Species the same as described under Alternative B.

Impacts to Special Status Species from vegetation treatments for sagebrush habitat in Greater Sage-Grouse core and connectivity habitat would be the same as described in Alternative A. In addition, the protocol in Appendix A would support more specific reclamation of sagebrush habitats, and could allow for more effective restoration of functional habitat for Special Status Species. Working collaboratively with partners to maintain and enhance Greater Sage-Grouse habitats could provide additional resources to apply to sagebrush management and could affect sagebrush obligate Special Status Species with enhanced habitat and forage. A 9% disturbance cap could further prevent habitat loss and disturbance to Special Status

Species. Mitigation to offset exceeding the 9% cap could provide habitat for Special Status Species, but revegetation of effective sagebrush habitat can take 15 or more years, depending on soil conditions, climate and weather, viability of seed and/or transplants, and ongoing maintenance to prevent invasive, non-native plant species from taking over the area.

Treated areas that are not rested from livestock grazing may not provide time for effective seed germination and growth. In areas where vegetation is protected, plants regenerate faster and can spread more effectively (Shaw et al. 2005). Within sagebrush habitat, grazed areas do not regenerate as densely as ungrazed areas, which could be as a result of trampling (Shaw et al. 2005). Impacts to Special Status Species could be habitat loss or fragmentation, or displacement which could lead to successful relocation if nearby habitat is available, or a move to lower quality habitat where survival or reproduction could be diminished from physiological stress or lack of forage and cover (Blickley et al. 2012).

Impacts to Special Status Species from reclamation of sage-grouse habitat would be the same as Alternative A.

Impacts to Greater Sage-Grouse from weed-free seed and mulch, desirable non-native species or sterile perennials, or reclaiming to native site plant composition for reclamation projects would be the same as Alternative A. In addition, under Alternative D within Greater Sage-Grouse core and connectivity habitat, the use of native and non-native plant seeds would benefit Special Status Species and could provide additional habitat for forage and cover. Short-term impacts to Special Status Species could occur from restoration activities from human and vehicle presence, noise, surface disturbance or longer term impacts of the possible introduction and spread of invasive, non-native plant species. Where restoration activities were successful, additional sagebrush habitat could benefit Special Status Species. Giving priority for implementing specific the use of native seeds or other non-native seeds based on the probability of success or benefits to Special Status Species habitats could allow for effective restoration of sagebrush habitat. Attempting to use native seeds not only provides appropriate vegetation for the climate and conditions, the use also can prevent the introduction and spread of invasive, non-native plant species which can alter habitat and render it unusable to Special Status Species. Non-native seeds can provide cover while native vegetation is being established and are also helpful in preventing the spread of invasive, non-native plant species.

Impacts to Special Status Species from habitat restoration projects in annual grassland would be the same as Alternative B

Impacts to Special Status Species from grasshopper and cricket control would be the same as Alternative A.

Impacts to Special Status Species from wild horse population management would be the same as Alternative A. Impacts to Special Status Species from prioritizing appropriate management levels (AML) in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative B. Impacts to Special Status Species from prioritizing and conducting land health assessments in BLM HMAs in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative B.

Impacts to Special Status Species from rehabilitation for areas burned by wildland fires would be the same as Alternative A. Impacts to Special Status Species from using wildland fire, prescribed fire, and fire suppression techniques would be the same as Alternative A. Impacts from using fire suppression techniques and AMR would be the same as Alternative A.

Impacts to Special Status Species from the use of monitoring plans would be the same as Alternative B.

Under Alternative D, management would not allow more than three locations of energy production to occur within 640 acres. In addition, the combined value of the disturbance (existing and proposed) may not exceed 9% loss of sagebrush habitat. Allowing a density of three energy production facilities/structures per 640 acres could displace Special Status Species, and the possible long-term habitat deterioration could eliminate potential habitat that may provide refuge for wildlife species displaced from current territories. Conversion of large areas to early seral stage vegetation or cheatgrass could occur as well pads are reclaimed. Conversion of large expanses to early seral vegetation could result in additional habitat loss from large plant cover, but could increase desired browse vegetation for Special Status Species. The spread of cheatgrass or other invasive, non-native plant species could diminish habitat quality and availability of native plant species for forage and cover. In addition, not including other disturbances such as coal and trona mines, and buried pipelines and power lines in the density calculations would, in some cases where these sites occur, increase actual disturbance density above three per 640 acres and further increase impacts to Special Status Species.

For connectivity areas, impacts from management under Alternative D would be the same as described above, except there is no limitation to the number of disruptive activities per 640 acres, but the combined 9% limit of disturbance per 640 acres would be in effect.

Impacts to Special Status Species from offsite mitigation would be the same as Alternative A, but would apply to Greater Sage-Grouse core habitat. The 9% disturbance threshold would limit the level of disturbance within Greater Sage-Grouse core habitat; however, the impacts to Special Status Species from disturbance would not change.

Impacts from implementing restrictions on surface disturbing activity or surface occupancy within 0.25 miles of lek habitat (Greater Sage-Grouse core, general, and connectivity habitat), would be similar to those described under Alternative A (excluding Bates Hole and Fish Creek/Willow Creek). Under this alternative, habitat fragmentation is likely to continue and habitat effectiveness would be decreased. The greater the impacts to sagebrush habitat from oil, gas, and other surface disturbing activity, the greater the impacts to sagebrush obligate and other sagebrush dependent species from habitat loss and disturbance from human activity, noise and invasive, non-native plant species. Special status plant species that are found within sagebrush habitat include divergent wild buckwheat, Ownbey's thistle, narrow-leafed bladderpod, and Swallen Mountain ricegrass. Special status plant species could be impacted by vegetation loss or damage, erosion and soil loss, and the introduction and spread of invasive, non-native plant species.

Applying seasonal restrictions on surface disturbing and/or disruptive activity during nesting and early brood-rearing season in Greater Sage-Grouse core, general, and connectivity habitat could protect habitat within two miles of a lek and the Special Status Species which use or occur within the identified area during March 15 to June 30. This management could allow for fewer disturbances to Special Status Species from noise, human presence, vehicle use, vegetation loss, and the introduction and spread of invasive, non-native plant species, which can force special status wildlife to move from high quality habitat to areas of lower quality, less desirable habitat.

Prohibiting surface disturbing and/or disruptive activities in mapped Greater Sage-Grouse winter concentration areas within Greater Sage-Grouse core habitat and connectivity areas from November 15 to March 14 would affect Special Status Species as described under Alternative A.

Implementing the strategies and techniques outlined in Appendix F for predators would provide protection to special status prey species, such as white-tailed prairie dog, Idaho pocket gopher, or pygmy rabbit by removing habitat and attractive areas where predators feed and hunt. Some of these areas, such as perching sites and edge habitat (roads and development sites), are associated with oil and gas development and can be an additional factor to the disruption of special status wildlife habitat. Reducing non-native or over-

populated predators could allow for native predators such as swift fox or hawk species to have less competition from those predators considered pest species (WGFD 2005d).

Impacts to Special Status Species from noise minimization would be the same as Alternative A.

Impacts to Special Status Species habitat from the use of adaptive management would be the same as Alternative B.

Greater Sage-Grouse–Alternative D

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

Restricting utility structures within Greater Sage-Grouse core and connectivity habitat areas would be similar to those identified in Alternative A, except new transmission projects would be allowed only within a designated two-mile wide transmission corridor and within 0.5 miles either side of existing 115kV or larger transmission lines. Where existing ROWs occur, disturbance to important sagebrush habitat would likely be minimal due to the conditions of ROW corridors where the land has been previously disturbed from prior facility construction. Construction activities could disturb Greater Sage-Grouse if they were to occur within two miles of occupied habitat, possibly causing birds to vacate the area into lower quality habitat. Seasonal stipulations prohibiting construction within lekking (March 15 to June 30) and winter concentration areas (December 1 to June 30) could allow less disturbance to Greater Sage-Grouse during these timeframes, and could prevent abandonment of critical habitat areas. Disturbed areas would be more vulnerable to invasion or spread of non-native plant species and diminish habitat function, can out compete with native forage, and prevent the area from restoring with native or desirable plant species. Utility towers could provide perch sites for raptors that prey on Greater Sage-Grouse, possibly resulting in increased predation. In addition, if grouse experience or perceive a greater threat of harassment and/or predation, they might avoid areas with overhead structures.

If new transmission projects were constructed in areas where it is demonstrated that declines in Greater Sage-Grouse would not be caused, impacts could be minimal to Greater Sage-Grouse. Management for construction would consider impacts to Greater Sage-Grouse populations and be designed to minimize impacts through project design and mitigation. The considerations could reduce the impacts to Greater Sage-Grouse from disturbance and habitat loss by habitat avoidance or timing of construction. Construction of new transmission projects could cause vegetation loss, habitat degradation, and invasion of exotic plant species. If construction of new ROW corridors were to occur, the resulting fragmentation of formerly intact habitat could affect Greater Sage-Grouse populations by severing migration routes to seasonal habitat areas, such as winter habitat and nesting or early brood rearing areas. Disturbed areas would be more vulnerable to invasion or spread of non-native plant species and diminish habitat function, can out compete with native forage, and prevent the area from restoring with native or desirable plant species. Utility towers could provide perch sites for raptors that prey on Greater Sage-Grouse, possibly resulting in increased predation or could cause mortality from collisions or electrocution. If grouse experience or perceive a greater threat of harassment and/or predation, they could avoid areas with overhead structures.

There would be 5,230,110 acres of ROW exclusion areas within Greater Sage-Grouse core and connectivity habitat, 4,944,180 more acres than Alternative A. Impacts to Greater Sage-Grouse would be the same as Alternative B; however, the density of disturbance limit for this alternative is 9%, allowing greater disturbance of habitat from development activities before mitigation would be made necessary. Allowing Greater Sage-Grouse general habitat to be available for new ROWs or SUAs subject to BMPs, with 1,300,510 acres of avoidance areas (1,159,830 fewer acres than Alternative A) could impact Greater Sage-Grouse from direct habitat loss and fragmentation of habitat. If construction of new ROW corridors were to occur, the resulting fragmentation of formerly intact habitat could affect Greater Sage-Grouse

populations by severing migration routes to seasonal habitat areas such as winter habitat and nesting or early brood rearing areas. Disturbed areas would be more vulnerable to invasion or spread of non-native plant species and diminish habitat function, can out compete with native forage, and prevent the area from restoring with native or desirable plant species. Utility towers could provide perch sites for raptors that prey on Greater Sage-Grouse, possibly resulting in increased predation or could cause mortality from collisions or electrocution. If grouse experience or perceive a greater threat of harassment and/or predation, they could avoid areas with overhead structures. Maintenance and upgrades of existing structures could result in short-term disturbance of Greater Sage-Grouse from human and vehicle activity, but long-term impacts would be minimal.

Impacts to Greater Sage-Grouse from the development of wind energy would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,608,420 acres (Map 2-32), which would reduce the level of wind energy development and related impacts on Special Status Species. As a result of these restrictions, 980 turbines are expected to be developed, 274 fewer than under Alternative A. The development of wind energy would cause habitat loss, and both short and long-term impacts to habitat for Greater Sage-Grouse. Disturbance during installation of towers, roads, and infrastructure could force Greater Sage-Grouse away from habitat within at least 0.25 miles of the construction. Greater Sage-Grouse will avoid and abandon areas where overhead structures, such as power lines, occur due to the increased risk of predation from raptors; and are also at risk of collisions with vehicles, guy-wires, and fences (Walker et al. 2007). Habitat that Greater Sage-Grouse use for leks is within elevated or flat grassland sites with few vertical obstructions, areas that are also prime lands for the installation of wind turbines (Strickland et al. 2011). Although there is no conclusive evidence that wind energy developments cause reductions in Greater Sage-Grouse lek numbers, because the species is sensitive to disturbance and habitat fragmentation, there is a high likelihood that Greater Sage-Grouse would be impacted by wind energy development. These impacts could occur under Alternative D in Greater Sage-Grouse general habitat but to a lesser degree than under Alternative A, due to the reduced number of turbines projected to be developed. Restrictions on MET towers would have the same impacts to Greater Sage-Grouse as in Alternative A.

Retaining ownership of Greater Sage-Grouse core and connectivity habitat unless other economic or other benefits are determined would affect Greater Sage-Grouse the same as Alternative B, unless the parcel was not retained. Impacts to Greater Sage-Grouse from disposal of core and connectivity habitat would depend on which agency or party acquired the land and the type of management was planned for the parcel.

Impacts to Greater Sage-Grouse from acquisitions or conservation easements would be the same as Alternative A. Acquiring lands based on a variety of economic resource criteria could have limited effects to Greater Sage-Grouse depending on the lands acquired or exchanged.

Impacts to Greater Sage-Grouse from livestock grazing management would be the same as Alternative A. Working cooperatively with permittees, leasees and other landowners to develop grazing management strategies on an allotment-by-allotment basis to improve Greater Sage-Grouse habitat could affect Greater Sage-Grouse from possible habitat improvement. It is unknown, however, what level of long-term protection of habitat would occur, because the outcome is at each permittee's, leasee's or landowner's discretion. If permittees, leases, or landowners agree to develop grazing management strategies, there could be a reduction of habitat loss in sagebrush or Greater Sage-Grouse habitat, or could be seasonal closures.

Impacts to Greater Sage-Grouse from adjusting livestock grazing management would be the same as Alternative A; in addition, prioritizing oversight and effectiveness monitoring of grazing activities could ensure that ongoing permit compliance and Wyoming Land Health Standards are being met and that habitat and cover is being maintained and available for Greater Sage-Grouse. Impacts to Greater Sage-Grouse from livestock grazing permit renewals would be the same as Alternative A. In addition, within Greater Sage-

Grouse core and connectivity habitat, incorporating site specific sage-grouse habitat objectives could provide habitat components or a greater focus on sagebrush habitat within grazing allotments.

Impacts to Greater Sage-Grouse from developing conservation plans to meet seasonal Greater Sage-Grouse habitat requirements in Greater Sage-Grouse core and connectivity habitats would be the same as Alternative A. Impacts to Greater Sage-Grouse from authorizing retirement of grazing allotments in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative A, although under Alternative D, a limit of 15% of a planning unit would constrain how much land could be retired or rested. Temporary use of retired allotments to rest other allotments could allow sagebrush habitat in those rested allotments time to restore and provide greater habitat and forage values for Greater Sage-Grouse. Impacts to Greater Sage-Grouse from considering drought conditions in livestock grazing management would be the same as Alternative A.

Impacts to Greater Sage-Grouse from evaluating range improvements would be the same as Alternative B, but would also apply to Greater Sage-Grouse general habitat as well as core and connectivity/priority habitat. Impacts to Greater Sage-Grouse from livestock trailing management would be the same as Alternative A. Impacts to Greater Sage-Grouse from riparian area management would be the same as Alternative B. Impacts to Greater Sage-Grouse from water developments would be the same as Alternative A, but would apply to the entire planning area.

Impacts to Greater Sage-Grouse from exceptions to lease stipulations, COAs, and T&Cs would be the same as Alternative A.

Impacts from oil and gas leasing would be similar to those described under Alternative A; however, they would occur within fewer acres, reducing the overall impacts to Special Status Species. Slightly fewer wells, 15,769, are predicted to be drilled under Alternative D as compared to Alternative A; 642 fewer than Alternative A. Under Alternative D, 964,860 acres would be closed to oil and gas leasing, 93,080 more acres as compared to Alternative A. A lower number of acres would be disturbed over the short and long term under Alternative D as compared to Alternative A (4,039 fewer acres over the short term; and 1,026 fewer acres over the long term). Exceptions to lease stipulations, COAs and T&Cs considered on a case-by-case basis for Greater Sage-Grouse habitat in all field offices could allow impacts to sagebrush and Greater Sage-Grouse if oil and gas development were to occur near important habitat areas. Impacts to Greater Sage-Grouse from geophysical operations would be the same as Alternative A.

Impacts to Greater Sage-Grouse from offsite mitigation would be the same as Alternative A. Impacts to Greater Sage-Grouse from working with proponents holding valid existing leases would be the same as Alternative B. Impacts to Greater Sage-Grouse from working with project proponents (including those within BLM/Forest Service) to site their projects in locations that minimize impacts to sensitive resources would be the same as Alternative A. Impacts to Greater Sage-Grouse from using unitization would be the same as Alternative B.

Impacts to Greater Sage-Grouse from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative A.

Impacts to Greater Sage-Grouse from coal lease development and exploration would be the same as Alternative A. Under Alternative D, 261,000 acres are closed to non-energy, solid leasable mineral leasing, the same as Alternative A. Applying Criterion 15, upon receipt of a coal lease application in Greater Sage-Grouse core and connectivity areas, to determine that all or certain stipulated methods of coal mining will not have a significant long-term impact on the Greater Sage-Grouse could prevent or reduce impacts to Greater Sage-Grouse from coal development. If special conditions are required as identified during the leasing process to protect Greater Sage-Grouse resources, additional steps could be taken to reduce impacts

such as noise, surface disturbance, fragmentation of habitat from roads or other linear features, or the spread of invasive, non-native plant species—all of which could force Greater Sage-Grouse to abandon habitat.

Impacts to Greater Sage-Grouse from non-energy leasable minerals would be the same as Alternative A. In addition, mitigation measures in project planning could provide some type of protection to sagebrush habitat or Greater Sage-Grouse. Possible measures could reduce initial disturbance, provide rehabilitation of sites, and/or create other areas sagebrush habitat. Allowing projects that meet compliance of surface occupancy and disturbance and density stipulations could reduce fragmentation of habitat, and may reduce other impacts from surface disturbance or habitat fragmentation from using existing infrastructure.

Impacts to Greater Sage-Grouse from locatable and salable mineral activities would be the same as Alternative A and 1,892,620 acres would be closed (withdrawn) for locatable and 472,800 acres would be closed for salable, the same as Alternative A. Impacts to Greater Sage-Grouse from salable mineral pits would be the same as Alternative A.

Impacts to Greater Sage-Grouse from approving BLM SRPs and Forest Service RSUAs would be the same as Alternative A, and impacts to Greater Sage-Grouse from managing open OHV areas would be the same as Alternative A.

Impacts to Greater Sage-Grouse from limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative A.

New road construction would avoid areas within 0.25 miles of the perimeter of occupied Greater Sage-Grouse leks within Greater Sage-Grouse core and connectivity habitat, the same as Alternative A. The management would provide buffer distances for Greater Sage-Grouse from the presence and construction activities of roads, but not a sufficient buffer distance to prevent population declines from the presence of roads and disruptive activity (Walker et al. 2007). Holloran (2005) determined that 1.9 miles from a main haul road was the minimum distance from leks where population declines did not occur, depending on traffic volume. Lower volume roads require a buffer distance recommended by Holloran (2005) of 0.6 miles, which is greater than the proposed 0.25 buffer distance for all new roads under Alternative D. Increased predation and collisions with vehicles are other threats to Greater Sage-Grouse from new road construction. Habitat loss and the barrier of the road could further impact sage-grouses' ability to migrate from leks to nesting and early brood rearing habitat. Availability of edge habitat from roads for predators within 0.25 miles of occupied leks could increase the threat of predation. Collisions of Greater Sage-Grouse with vehicles may also occur when roads are constructed within Greater Sage-Grouse habitat. This alternative provides the smallest buffer distance and the least protection of the action alternatives to protect Greater Sage-Grouse from the impacts from the building and presence of roads within lek habitat.

Road upgrades within Greater Sage-Grouse core and connectivity habitat could cause vegetation loss, habitat degradation, and invasion of exotic plant species. Upgrades would not create new linear disturbances, so new threats of fragmentation of formerly intact habitat would likely not affect Greater Sage-Grouse populations by severing migration routes to seasonal habitat areas the way new road construction would. Disturbed areas would be more vulnerable to invasion or spread of non-native plant species and diminish habitat function, can out compete with native forage, and prevent the area from restoring with native or desirable plant species. Human presence, vehicles, and equipment would cause disturbance and noise, which could force Greater Sage-Grouse to abandon the area either temporarily or permanently. Habitat abandonment could lead to successful relocation if nearby habitat is available, or a move to lower quality habitat where survival or reproduction could be diminished from physiological stress or lack of forage and cover (Blickley et al. 2012).

Allowing natural deterioration of roads not designated in travel management plans within Greater Sage-Grouse core, connectivity, and general habitat could prevent effects to Greater Sage-Grouse from human presence, vehicles, and equipment during reclamation efforts. Disturbed areas and vehicle routes are vulnerable to invasion of noxious weeds, which could spread during the natural deterioration of the road. Natural deterioration could allow for continued reclamation from surrounding plant species, which in Greater Sage-Grouse core, connectivity, and general habitat would likely be Wyoming big sagebrush, or other sagebrush species and associated forbs and grasses.

Natural reseeding within Greater Sage-Grouse core, connectivity, and general habitat would allow for succession of native plant species to revegetate undesignated roads or routes. In Greater Sage-Grouse core, connectivity, and general habitat, many areas would naturally reseed with Wyoming big sagebrush, or other sagebrush species, and associated forbs and grasses. Natural reseeding could be effective if there is enough precipitation to allow germination of the seedbank, and the area is not already dominated by invasive, non-native plant species (WGFD 2010c, Lambert 2005). Greater Sage-Grouse could benefit long term from the regrowth of sagebrush habitat for habitat and forage.

Within Greater Sage-Grouse core and connectivity habitat, managing for vegetation composition and structure that reflects the desired plant community or comparable standard would affect Greater Sage-Grouse the same as described under Alternative B.

Impacts to Greater Sage-Grouse from vegetation treatments for sagebrush habitat in Greater Sage-Grouse core and connectivity habitat would be the same as described in Alternative A. In addition, the protocol in Appendix A would support more specific reclamation of Greater Sage-Grouse and sagebrush habitats, and could allow for more effective restoration of functional habitat for Greater Sage-Grouse. If the protocol is followed, soil erosion and introduction of exotic or invasive plant species could be minimized and the landscape could be reclaimed to the original habitat components and structure to the extent possible. While the initial disturbance would result in habitat loss, sagebrush habitat could be restored over the long term; although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas. Working collaboratively with partners to maintain and enhance Greater Sage-Grouse habitats could provide additional resources to apply to sagebrush management and could affect Greater Sage-Grouse with enhanced habitat and forage. A 9% disturbance cap could further prevent habitat loss and disturbance to Greater Sage-Grouse. Mitigation to offset exceeding the 9% cap could provide habitat for Greater Sage-Grouse, but revegetation of effective sagebrush habitat can take ten or more years, depending on soil conditions, climate and weather, viability of seed and/or transplants, and ongoing maintenance to prevent invasive, non-native plant species from taking over the area.

Treated areas that are not rested from livestock grazing may not provide time for effective seed germination and growth. In areas where vegetation is protected, plants regenerate faster and can spread more effectively (Shaw et al. 2005). Within sagebrush habitat, grazed areas do not regenerate as densely as ungrazed areas, which could be as a result of trampling (Shaw et al. 2005). Impacts to Greater Sage-Grouse could be habitat loss or fragmentation, or displacement, which could lead to successful relocation if nearby habitat is available, or a move to lower quality habitat where survival or reproduction could be diminished from physiological stress or lack of forage and cover (Blickley et al. 2012). Impacts to Greater Sage-Grouse from reclamation of sage-grouse habitat would be the same as Alternative A.

Impacts to Greater Sage-Grouse from weed-free seed and mulch, desirable non-native species or sterile perennials, or reclaiming to native site plant composition for reclamation projects would be the same as Alternative A. In addition, under Alternative D within Greater Sage-Grouse core and connectivity habitat, the use of native and non-native plant seeds would benefit Greater Sage-Grouse and could provide

additional habitat for Greater Sage-Grouse forage and cover. Short-term impacts to Greater Sage-Grouse could occur from restoration activities from human and vehicle presence, noise, surface disturbance or longer term impacts of the possible introduction and spread of invasive, non-native plant species. Where restoration activities were successful, additional sagebrush habitat would benefit Greater Sage-Grouse. Giving priority for implementing specific the use of native seeds or other non-native seeds based on the probability of success or benefits to Greater Sage-Grouse habitats could allow for effective restoration of sagebrush and eventual Greater Sage-Grouse habitat. Attempting to use native seeds not only provides appropriate vegetation for the climate and conditions, the use also can prevent the introduction and spread of invasive, non-native plant species that can alter habitat and render it unusable to Greater Sage-Grouse. Non-native seeds can provide cover while native vegetation is being established and are also helpful in preventing the spread of invasive, non-native plant species that can alter habitat and render it unusable to Greater Sage-Grouse. Impacts to Greater Sage-Grouse from habitat restoration projects in annual grassland would be the same as Alternative B

Impacts to Greater Sage-Grouse from grasshopper and cricket control would be the same as Alternative A.

Impacts to Greater Sage-Grouse from wild horse population management would be the same as Alternative A. Impacts to Greater Sage-Grouse from prioritizing AMLs and prioritizing and conducting land health assessments in BLM HMAs in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative B.

Impacts to Greater Sage-Grouse from rehabilitation for areas burned by wildland fires, using wildland fire, prescribed fire, fire suppression techniques, and AMR would be the same as Alternative A.

Impacts to Greater Sage-Grouse from the use of monitoring plans would be the same as Alternative B.

Within Greater Sage-Grouse core habitat, management would not allow more than three locations of energy production to occur within 640 acres. In addition, the combined value of the disturbance (existing and proposed) may not exceed 9% loss of sagebrush habitat. Holloran's (2005) study showed that the number of males on leks declined when the density of wells reached more than five wells within 1.9 miles; and when density was between one and three wells per 1.9 miles, numbers of male birds on leks did not decline. The density of disruptive activities under Alternative D for Greater Sage-Grouse core habitat would allow for greater density of disturbance as compared with Alternative B, and would exceed the recommended density of disturbance by Holloran (2005) and Walker et al. (2007).

Allowing a density of three energy production facilities/structures per 640 acres could displace Greater Sage-Grouse, and the possible long-term habitat deterioration could eliminate potential habitat that may provide refuge for Greater Sage-Grouse displaced from current territories. Conversion of large areas to early seral stage vegetation or cheatgrass could occur as well pads are reclaimed. Conversion of large expanses to early seral vegetation could result in additional habitat loss and the resulting population decline of Greater Sage-Grouse if this occurred within severe winter range or nesting habitat (Doherty et al. 2008; Holloran et al. 2005). In addition, female Greater Sage-Grouse are known to have a high fidelity to their natal nesting habitat; it could be 5–9 years before the nesting population response to a gas field development is realized (Holloran 2005). Yearling female Greater Sage-Grouse displaced from their natal habitat have been found to have a lower nest initiation rate than those that remained, perhaps because of unfamiliarity with the habitat (Kaiser 2006). Over time, female Greater Sage-Grouse chose nest sites farther from active drilling rigs and producing gas wells, suggesting a long-term avoidance of active natural gas developments (Holloran 2005). Inglefinger (2001) found that for lands within 328 feet of a road or well pad, the density of sagebrush obligate birds drops by 50% regardless of the amount of activity on the road. Not including other disturbances such as coal and trona mines, and buried pipelines and power lines in the density

calculations would, in some cases where these sites occur, increase actual disturbance density above three per 640 acres and further increase impacts to Greater Sage-Grouse and their habitat.

For connectivity areas, impacts from management under Alternative D would be the same as described above, except there is no limitation to the number of disruptive activities per 640 acres, but the combined 9% limit of disturbance per 640 acres would be in effect.

Impacts to Greater Sage-Grouse from offsite mitigation would be the same as Alternative A, but would apply to Greater Sage-Grouse core and connectivity habitat. In addition, conducting mitigation within the same population area where the impact occurs if possible could provide habitat components for Greater Sage-Grouse in proximity to the population impacted by the development. The initial mitigation disturbance could result in habitat loss, sagebrush habitat could be restored over the long term; although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas. Mitigation to offset exceeding the 9% cap could provide habitat for Greater Sage-Grouse, but revegetation of effective sagebrush habitat can take 10 or more years, depending on soil conditions, climate and weather, viability of seed and/or transplants, and ongoing maintenance to prevent invasive, non-native plant species from taking over the area.

Impacts from implementing restrictions on surface disturbing activity or surface occupancy within 0.25 miles of lek habitat (Greater Sage-Grouse core, general, and connectivity habitat), would be similar to those described under Alternative A (excluding Bates Hole and Fish Creek/Willow Creek). Under this alternative, habitat fragmentation is likely to continue and habitat effectiveness would be decreased.

Impacts to Greater Sage-Grouse from applying seasonal restrictions from March 15 to June 30 on surface disturbing and/or disruptive activity during nesting and early brood-rearing season in Greater Sage-Grouse core, general, and connectivity habitat could prevent disturbance two miles of a lek during their sensitive nesting and early brooding period. This management could allow for fewer disturbances to Greater Sage-Grouse from noise, human presence, vehicles, and machinery, protecting nesting success and the development of young grouse (Blickley et al. 2012). Disturbance could cause females to abandon their nests, or move to less desirable/lower quality habitat for nesting. Moving to lower quality habitat and/or nest abandonment can result in lower reproductive success and lead to the further decrease in Greater Sage-Grouse populations.

Prohibiting surface disturbing and/or disruptive activities in mapped Greater Sage-Grouse winter concentration areas within Greater Sage-Grouse core habitat and connectivity areas from November 15 to March 14 would affect Greater Sage-Grouse as described under Alternative A.

Impacts to Greater Sage-Grouse from minimizing impacts from predators are the same as Alternative A. In addition, implementing the strategies and techniques outlined in Appendix F for predators could provide more protection to Greater Sage-Grouse by removing habitat and attractive areas where predators feed and hunt; possibly reducing the threat of predation.

Impacts to Greater Sage-Grouse from noise minimization would be the same as Alternative A.

Impacts to Greater Sage-Grouse from the use of adaptive management would be the same as Alternative B.

4.14.7 Proposed Land Use Plan Amendments

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

Impacts to Special Status Species from development of transmission projects would be similar to those described under Alternative D. Including transmission lines outside of transmission corridors in the 5% disturbance calculation could protect Special Status Species from habitat loss and result in fewer disruptions in habitat connectivity. In addition, managing PHMA and open areas as avoidance areas for ROWs could allow for the placement of ROWs outside of designated corridors if project proponents could meet the avoidance criteria exceptions; however, using current technology and development methods, meeting the exception criteria is unlikely. Disturbance and development can create travel or migration barriers which can alter distribution patterns, increasing stress, energy loss, and fitness for Special Status Species. Requiring all new transmission and distribution towers/structures to be designed to include raptor perching deterrents could protect Special Status Species from predation by raptors, ravens, or crows. Buffer distances of 0.6 miles from occupied leks could prevent threats to Special Status Species from overhead predation from raptors or other predatory birds or avoidance behavior by Special Status Species. Seasonal restrictions and buffer distances for agricultural and residential electrical distribution lines surface occupancy and surface disturbing activity within 0.6 miles from an occupied lek, or within March 15 to June 30 could provide Special Status Species some protection from habitat loss and disturbance.

Issuing new ROWs or SUAs outside of existing designated ROW corridors could result in future disturbing activities; however, constraints, density limitations, demonstrating no declines, and other protective measures could reduce the impacts to Special Status Species from habitat loss, disturbance, fragmentation, predation, and results of linear corridor development.

Within Greater Sage-Grouse habitat, there would be 285,930 acres of ROW exclusion areas, the same as in Alternative A.

Impacts to Special Status Species from removal, modifying, or burying existing power lines, reclaiming linear features such as roads or fences would be the same as Alternative B.

Impacts to Special Status Species from the development of wind energy would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,731,350 acres (Map 2-33) in PHMAs, which would reduce the level of wind energy development and related impacts on Special Status Species. As a result of these and other land use restrictions, 127 turbines are expected to be developed, 90% fewer turbines than under Alternative A. Impacts to Special Status Species from MET towers would be the same as Alternative A, but would be applied to all PHMAs. There would be additional restrictions to wires for MET tower supports, which would provide additional protection to special status prey species by preventing the perching of raptors and marking collision obstacles. A larger buffer distance of two miles from active leks for new temporary MET towers could reduce the perceived and actual threat of overhead predation to small Special Status Species.

Impacts to Special Status Species from retaining public ownership of PHMAs would be the same as Alternative B. Impacts to Special Status Species from identifying areas where acquisitions or conservation easements for PHMAs would be the same as Alternative B.

Impacts to Special Status Species from working cooperatively with permittees, leasees and other landowners to develop grazing management strategies would be the same as Alternative B. Impacts to Special Status Species from livestock grazing permit renewals would be the same as Alternative D. Impacts to Special Status Species from evaluating land health standards to evaluate land health standards in PHMAs could identify where lands are or are not meeting standards. This could lead to future improvements to sagebrush or other habitat desirable to Special Status Species. Impacts to Special Status Species from authorizing retirement of grazing allotments in PHMAs would be the same as Alternative A. Impacts to Special Status Species from considering drought conditions in livestock grazing management would be similar to Alternative D, except management actions would not be limited to season of use or stocking rate

changes and drought contingency plans would be developed. This could allow greater ability to reduce impacts from livestock grazing.

The Proposed LUP Amendments would also include specific habitat objectives to maintain seasonal Greater Sage-Grouse habitat. This management direction would benefit those Special Status Species that require hiding cover more than Alternative A.

Impacts to Special Status Species from managing range improvements and supplements would be similar to those described under Alternative A. The management for existing range improvements would apply to PHMAs throughout the planning area and could further reduce impacts to special status wildlife from fences by decreasing the chances of entanglement and could prevent harm to special status wildlife from other hazards that could be identified during evaluations.

Impacts to Special Status Species from current livestock trailing practices would be the same as described under Alternative A. In addition, applying trailing plans to utilize non-habitat and other management to prevent impacts to leks and sage-grouse habitat could prevent disturbance to sagebrush dependent species and prevent possible habitat abandonment by special status wildlife. While trailing could still occur, impacts from loss of vegetation for forage and cover for special status wildlife, soil compaction, erosion, trampling of vegetation and habitat, and the spread of invasive non-native plant species could be reduced in sagebrush and sage-grouse habitat; however, impacts would still occur in other habitat within the planning area. Impacts to Special Status Species from managing livestock grazing in riparian/wetland habitat would be the same as Alternative B. Impacts to Special Status Species habitat from water developments would be similar to those described in Alternative A, except existing developments that have a negative effect on PHMAs would be evaluated and modified. This could provide additional protections to Special Status Species habitat by reducing disruptions in riparian habitat and by supporting overall habitat continuity.

Impacts to Special Status Species from exceptions to lease stipulations, COAs, and T&Cs would be the same as Alternative A.

Under the Proposed LUP Amendments, 883,670 acres would be closed to oil, gas and CBNG leasing, 11,890 more acres when compared to Alternative A. Impacts to Special Status Species from oil and gas leasing would be the similar to those described under Alternative A, except areas managed with NSO and CSU stipulations would be greatly increased to 441,690 and 6,438,480 acres in PHMAs, respectively. This would further reduce Special Status Species habitat loss and degradation caused by fluid mineral development. Applying a minimum lease size could provide a more contiguous, uninterrupted habitat which could allow for unfragmented migration pathways between habitat areas, and could protect Special Status Species from human presence and other disturbance or disruptive activities. Impacts to Special Status Species habitat from geophysical exploration would be the same as Alternative B.

Impacts to Special Status Species from offsite mitigation would be the same as Alternative A. Impacts to Special Status Species from working with proponents holding valid existing leases would be the same as Alternative B. Impacts to Special Status Species from working with project proponents (including those within BLM/Forest Service) to site their projects in locations that minimize impacts to sensitive resources would be the same as Alternative A.

Impacts to Special Status Species from considering or encouraging Master Development Plans and unitization within PHMAs would be the same as Alternative B. Impacts to Special Status Species from requiring reclamation bonds would be the same as Alternative B.

Impacts to Special Status Species from CBNG produced water would be the same as Alternative A.

Impacts to Special Status Species habitat from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative B.

Impacts to Special Status Species from coal surface mining would be the same as Alternative D. Impacts to Special Status Species from coal surface and underground mining and coal exploration would be the same as Alternative A.

Impacts to Special Status Species from leasing non-energy leasable minerals would be the same as Alternative D.

Impacts to Special Status Species from locatable mineral development activities would be similar to Alternative A, except 1,146,130 acres within PHMAs would be proposed for withdrawal or considered for proposed withdrawal (Map 2-23), which would eliminate all impacts from locatable mineral development within these areas.

Impacts to Special Status Species from salable mineral activities would be the same as Alternative A.

Approving BLM SRPs and Forest Service RSUAs would be the same as Alternative A; however, in PHMAs, those impacts would have to be mitigated for permits to be approved. Mitigation actions could include reduction of noise and habitat disturbance, re-locating an event or changing the time when and event could occur, all of which could reduce disturbance or disruption to Special Status Species.

Impacts to Special Status Species from not designating new ACECs/SIAs for Greater Sage-Grouse conservation would be the same as Alternative D.

Impacts to Special Status Species from OHV “open” areas would be the same as Alternative B, except for the Poison Spider OHV Park, which would be the same as Alternative A.

Impacts to Special Status Species from limiting motorized travel would be the same as Alternative A.

Impacts from avoiding areas within 1.9 miles of the perimeter of occupied Greater Sage-Grouse leks for new and primary roads, and prohibiting the construction of other new roads within 0.6 miles of occupied leks would be similar to Alternative B. The areas outside of the 0.6-mile buffer are not prohibited from construction; roads could be built inside these areas if deemed appropriate, which would impact the Special Status Species inhabiting those areas. Road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Human presence and vehicles may force Special Status Species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals, but these areas may be avoided by prey species which may move to less desirable habitat to avoid predation.

Impacts to Special Status Species from road upgrades would be the same as Alternative B.

Impacts to Special Status Species from limiting route construction to realignments of existing routes in PHMAs would be the same as Alternative B. Impacts to Special Status Species habitat from restoring roads or trails not designated in travel management plans within PHMAs would be the same as Alternative B. Impacts to Special Status Species habitat from reseeding closed roads or trails in PHMAs would be the same as Alternative B.

Impacts to Special Status Species habitat from using ESD potential vegetation composition and structure within PHMAs and GHMAs would be the same as Alternative B, but would apply to a larger area (PHMAs and GHMAs–11,531,340 acres) than Alternative B (5,000,400 acres).

Impacts to Special Status Species habitat from vegetation treatments that would not reduce sagebrush canopy cover to less than 15% in nesting and winter habitat in PHMAs would be the same as Alternative B. Limiting this to northeast Wyoming could ensure that this management would be appropriate to the conditions inherent to the local environment and could allow for effective results from vegetation treatments and providing varied structure of sagebrush habitat.

Impacts to Special Status Species from vegetation treatments for sagebrush habitat in PHMAs would be the same as described in Alternative D.

Reclamation of Greater Sage-Grouse habitat in accordance to the Wyoming Reclamation Policy (2009a) would provide sufficient restoration of habitat following oil, gas, and other surface disturbing activities, the same as Alternative A. In addition, the protocol in Appendix A could guide the specific reclamation of Greater Sage-Grouse and sagebrush habitats, providing restoration of habitat for Special Status Species, and soil erosion or introduction of exotic or invasive plant species could be minimized. Special status plant species could be protected from vegetation loss or damage, erosion and soil loss, and the introduction and spread of invasive, non-native plant species. The landscape would be reclaimed to the original habitat components and structure to the extent possible. While the initial disturbance would result in habitat loss, some sagebrush habitat could be restored over the long term; although some areas of habitat, such as Greater Sage-Grouse winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas. The use of Appendix A for vegetation treatments would provide the same benefits for sagebrush habitat.

Impacts to Special Status Species from resting treated areas from grazing would be the same as Alternative A. Impacts to Special Status Species from restoration of sagebrush habitat would be the same as Alternative B. Impacts to Special Status Species from the use of native and non-native plants and seeds would be the same as Alternative D. Impacts to Special Status Species from managing post ES&R and BAER areas and altering existing seedings would be the same as Alternative B.

Impacts to Special Status Species from giving priority for implementing specific sage-grouse habitat restoration and establishing seed harvest areas would be the same as Alternative B. Impacts to Special Status Species from vegetation treatment planning would be the same as Alternative C.

Impacts to Special Status Species from grasshopper and cricket control would be the same as Alternative A; however, working collaboratively with partner agencies to maintain and enhance Greater Sage-Grouse habitat in PHMAs could reduce the effects to Special Status Species from treatment for insects.

Impacts to Special Status Species from wild horse management would be the same as Alternative B.

Impacts to Special Status Species from designing and implementing fuels treatments within PHMAs would be the same as Alternative B. Impacts to Special Status Species from restoring and recovering burned areas and fuels treatments within PHMAs would be the same as Alternative B and impacts to Special Status Species from managing post fuels management areas within PHMAs (core only) would also be the same as Alternative B. Impacts to Special Status Species using wildland fire, prescribed fire, and fire suppression techniques would be the same as Alternative A. Impacts to Special Status Species from fire suppression

within PHMAs would be the same as Alternative B. Impacts to Special Status Species from the use of monitoring plans within PHMAs would be the same as Alternative B.

Under the Proposed LUP Amendments, the BLM and Forest Service could limit the density of oil and gas or mining activities to no more than an average one disruptive activity to occur within 640 acres within PHMAs (core only); the combined value of surface disturbance (existing and proposed) may not exceed 5% loss. This level of density and development could allow for a minimal amount of disturbance of Special Status Species from disruptive activities and prevent decreases in populations from displacement and habitat loss and fragmentation. For PHMAs (connectivity only), all surface disturbance (any program area) would be limited to no more than 5% of PHMAs (core only) per 640 acres using the DDCT process described in Appendix D. For PHMAs (connectivity only), density of development could exceed one within 640 acres in these areas; in addition, surface disturbance would be limited to no more than 5%. Managing for density of disturbance could provide for greater habitat connectivity for Special Status Species. The 5% disturbance cap in the Proposed LUP Amendments is based on using the DDCT calculation method, which is a more fine-scale process. The 3% disturbance cap proposed in Alternative B is based on the Knick et al 2013 disturbance calculation model that is based on a larger landscape area of disturbance. As a result the 5% disturbance cap using the DDCT method actually translates into a 2-3% disturbance using the Knick model methodology. Due to the different calculation methodologies between the Wyoming DDCT method and the Knick, 2013 disturbance calculation presented in the COT report; the actual percent represented are not that different between Alternative B and the Proposed LUP Amendments.

Impacts to Special Status Species from using mitigation would be the same as described in Alternative A.

Under the Proposed LUP Amendments, surface disturbing activity or surface occupancy would be prohibited within 0.6 miles of occupied Greater Sage-Grouse leks inside PHMAs, and would be restricted within 0.25 miles of occupied Greater Sage-Grouse leks outside of PHMAs, which could protect up to 337,860 acres of habitat (Map 2-3). When compared with Alternative A, these restrictions could protect up to 269,310 more acres of habitat for Special Status Species, reducing impacts from habitat fragmentation, habitat loss, vegetation removal, soil loss and erosion, noise, human disturbance, or the introduction of invasive, non-native plant species such as cheatgrass, which can alter the composition of native species, and lead to the loss of forage and cover for Special Status Species.

Surface disturbing activity or surface occupancy would be prohibited or restricted on 160,630 acres, which would further help to protect sage-grouse habitat from construction and development activities. The impacts to Special Status Species would be similar to Alternative A, but would occur within more acres, reducing impacts from habitat fragmentation, habitat loss, vegetation removal, soil loss and erosion, noise, human disturbance, or the introduction of invasive, non-native plant species such as cheatgrass, which can alter the composition of native species, and lead to the loss of forage and cover for Special Status Species.

Applying seasonal restrictions during March 15 to June 30 to surface disturbing and/or disruptive activity during nesting and early brood-rearing season within PHMAs (core only) would allow for no disturbance or disruption to occur in PHMAs (core only) during this timeframe. This management could prevent stress from noise and human presence to Special Status Species. Applying seasonal restrictions during March 15 to June 30 to surface disturbing and/or disruptive activity during breeding, nesting, and early brood-rearing season within four miles of a lek in PHMAs (connectivity only) could prevent habitat loss and disturbance within the four-mile buffer during that timeframe. Special status species within the buffered area would benefit from the seasonal closure to disturbance and protection from noise and human activities. The same seasonal restrictions would apply to GHMAs, except there would be a two-mile buffer around leks, providing less protection than described above, the same as described under Alternative A.

Prohibiting surface disturbing and/or disruptive activities in Greater Sage-Grouse winter concentration areas within PHMAs and GHMAs from December 1 to March 14 would affect Special Status Species as described under Alternative A.

Impacts to Special Status Species from minimizing impacts from predators are the same as Alternative D.

Restricting noise at the perimeter of sage-grouse leks to not exceed 10 dBA above background noise could reduce disturbance to Special Status Species and could prevent special status wildlife from abandoning habitat and moving to less desirable areas. Noise minimization can reduce stress responses, prevent a reduction in reproductive success, and prevent decreased immune response (Pater et al. 2009).

Impacts to Special Status Species habitat from the use of adaptive management would be the same as Alternative B.

Greater Sage-Grouse–Proposed Land Use Plan Amendments

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

Impacts to Greater Sage-Grouse from development of transmission projects would be similar to those described under Alternative D. Including transmission lines outside of transmission corridors in the 5% disturbance calculation could protect Greater Sage-Grouse from habitat loss and result in fewer disruptions in habitat connectivity. In addition, managing PHMA and open areas as avoidance areas for ROWs could allow for the placement of ROWs outside of designated corridors if project proponents could meet the avoidance criteria exceptions; however, using current technology and development methods, meeting the exception criteria is unlikely. Disturbance and development can create travel or migration barriers which can alter distribution patterns, increasing stress, energy loss, and fitness for Greater Sage-Grouse. Requiring all new transmission and distribution towers/structures to be designed to include raptor perching deterrents could protect Greater Sage-Grouse from predation by raptors, ravens, or crows. Buffer distances of 0.6 miles from occupied leks could prevent perceived or actual threats to Greater Sage-Grouse from overhead predation from raptors or other predatory birds. Seasonal restrictions and buffer distances for agricultural and residential electrical distribution lines surface occupancy and surface disturbing activity within 0.6 miles from an occupied lek, or within March 15 to June 30 could provide Greater Sage-Grouse some protection from habitat loss and disturbance.

The proposed Gateway West, Gateway South, and TransWest Express transmission line projects are not subject to the Proposed LUP Amendments decision to designate PHMAs as avoidance areas. The projects are also exempt from the proposed Greater Sage-Grouse screening criteria, RDFs, buffers, tall structure requirements, and disturbance cap requirements identified in Chapter 2, Proposed Action and Alternatives.

The Obama Administration identified these transmission projects as a priority project, as part of the President's commitment to job creation and modernizing America's Infrastructure. These transmission projects are three of seven projects identified for expedited permit review and federal agency coordination among an interagency Rapid Response Team for Transmission (RRTT) established to foster coordination, expedite simultaneous permitting processes, and resolve permitting challenges, while ensuring appropriate environmental reviews.

The BLM is currently processing the application for the Gateway West, Gateway South, and TransWest Express projects, high-voltage transmission lines, which includes alternatives through Greater Sage-Grouse habitat in Wyoming. The BLM is analyzing conservation measures for Greater Sage-Grouse as part of the review process for the Gateway West, Gateway South, and TransWest Express projects.

The Gateway West, Gateway South, and TransWest Express projects are analyzed in detail in the cumulative impacts section of this plan.

Issuing new ROWs or SUAs outside of existing designated ROW corridors could result in future disturbing activities; however, constraints, density limitations, demonstrating no declines, and other protective measures could reduce the impacts from habitat loss, disturbance, fragmentation, predation, and results of linear corridor development.

Within Greater Sage-Grouse habitat, there would be 285,930 acres of ROW exclusion areas, the same as in Alternative A.

Impacts to Greater Sage-Grouse from removal, modifying, or burying existing power lines, reclaiming linear features such as roads or fences would be the same as Alternative B.

Impacts to Greater Sage-Grouse from the development of wind energy would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,731,350 acres (Map 2-33), which would reduce the level of wind energy development and related impacts on Greater Sage-Grouse. As a result of these and other land use restrictions, 127 turbines are expected to be developed, 90% fewer turbines than under Alternative A.

Impacts to Greater Sage-Grouse from MET towers would be the same as Alternative A, but would be applied to all PHMAs. There would be additional restrictions to wires for MET tower supports, which would provide additional protection to Greater Sage-Grouse by preventing the perching of raptors and marking collision obstacles. A larger buffer distance of two miles from active leks for new temporary MET towers could reduce the perceived and actual threat of overhead predation to Greater Sage-Grouse.

Utilizing Greater Sage-Grouse habitat requirements to prioritize parcels for exchange or acquisition within PHMAs could provide habitat management for Greater Sage-Grouse on parcels acquired by the BLM.

Impacts to Greater Sage-Grouse from the evaluation of non-mineral withdrawals for consistency with Greater Sage-Grouse conservation would be the same as Alternative B.

Impacts to Greater Sage-Grouse from retaining public ownership and acquisitions or conservation easements of PHMAs would be the same as Alternative B. Utilizing Greater Sage-Grouse habitat requirements to prioritize parcels for exchange or acquisition within PHMAs could provide habitat management for Greater Sage-Grouse on parcels acquired by the BLM. Impacts to Greater Sage-Grouse from the evaluation of non-mineral withdrawals for consistency with Greater Sage-Grouse conservation would be the same as Alternative B.

Impacts to Greater Sage-Grouse from working cooperatively with permittees, leases, and other landowners to develop grazing management strategies would be the same as Alternative B. Impacts to Greater Sage-Grouse from livestock grazing permit renewals would be the same as Alternative D.

On National Forest System lands in nesting habitat, livestock grazing would be managed to maintain residual grass height of 7 inches during the nesting season. In wet meadows and riparian areas, livestock grazing would be managed to retain a four-inch stubble height in brood rearing and summer habitat. This management direction would benefit Greater Sage-Grouse more than Alternative A by increasing hiding cover during nesting and early brood rearing seasons. Increased hiding cover would likely increase nest success and brood survival (Doherty et al. 2014).

Impacts to Greater Sage-Grouse from evaluating land health standards to evaluate land health standards in PHMAs could identify where lands are or are not meeting standards. This could lead to future improvements to sagebrush or other habitat desirable to Greater Sage-Grouse. Impacts to Greater Sage-Grouse from authorizing retirement of grazing allotments would be the same as Alternative A. Impacts to Greater Sage-Grouse from considering drought conditions in livestock grazing management would be similar to Alternative D, except management actions would not be limited to season of use or stocking rate changes and drought contingency plans would be developed. This could allow greater ability to reduce impacts from livestock grazing.

Impacts to Greater Sage-Grouse from managing range improvements and supplements would be similar to those described under Alternative A. The management for existing range improvements would apply to PHMAs throughout the planning area and could further reduce impacts to from fences and other hazards.

Impacts to Greater Sage-Grouse from current livestock trailing practices would be the same as described under Alternative A. In addition, applying trailing plans to utilize non-habitat and other management to prevent impacts to leks and sage-grouse habitat could prevent disturbance to sage-grouse and prevent possible habitat abandonment. While trailing could still occur, impacts associated with soil compaction, erosion, trampling of vegetation and habitat, and the spread of invasive non-native plant species could be reduced in sagebrush and sage-grouse habitat. Impacts to Greater Sage-Grouse from managing livestock grazing in riparian/wetland habitat would be the same as Alternative B. Impacts to Greater Sage-Grouse from water developments would be similar to those described in Alternative A, except existing developments that have a negative effect on PHMAs would be evaluated and modified. This could provide additional protections to sage-grouse habitat by reducing disruptions in riparian habitat and by supporting overall habitat continuity.

Impacts to Greater Sage-Grouse from exceptions to lease stipulations, COAs, and T&Cs would be the same as Alternative A.

Under the Proposed LUP Amendments, 883,670 acres would be closed to oil, gas, and CBNG leasing, 11,890 more acres when compared to Alternative A. Impacts to Greater Sage-Grouse from oil and gas leasing would be similar to those described under Alternative A, except areas managed with NSO and CSU stipulations would be greatly increased to 441,690 and 6,438,480 acres, respectively. This would further reduce sage-grouse habitat degradation and disturbances to sage-grouse breeding and nesting activities. Applying a minimum lease size could provide a more contiguous, uninterrupted habitat for Greater Sage-Grouse, which would allow for unfragmented migration pathways between habitat areas, and could protect birds from human presence and other disturbance or disruptive activities. Impacts to Greater Sage-Grouse habitat from geophysical exploration would be the same as Alternative B. Impacts to Greater Sage-Grouse from offsite mitigation would be the same as Alternative A. Impacts to Greater Sage-Grouse from working with proponents holding valid existing leases would be the same as Alternative B.

Impacts to Greater Sage-Grouse from working with project proponents (including those within BLM/Forest Service) to site their projects in locations that minimize impacts to sensitive resources would be the same as Alternative A. Impacts to Greater Sage-Grouse from considering or encouraging Master Development Plans, unitization, and requiring reclamation bonds within PHMAs would be the same as Alternative B.

Impacts to Greater Sage-Grouse from produced water would be the same as Alternative A.

Impacts to Greater Sage-Grouse habitat from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative B.

Impacts to Greater Sage-Grouse from coal surface mining would be the same as Alternative D. Impacts to Greater Sage-Grouse from underground coal mining and coal exploration in PHMAs would be the same Alternative A.

Impacts to Greater Sage-Grouse from leasing non-energy leasable minerals would be the same as Alternative D.

Impacts to Greater Sage-Grouse from locatable mineral development activities would be similar to Alternative A, except 894,060 acres within SFAs would be considered for proposed withdrawal and 252,070 acres would be proposed for withdrawal (Map 2-23), which would eliminate all impacts from locatable mineral development within these areas.

Impacts to Greater Sage-Grouse from salable mineral activities would be the same as Alternative A.

Approving BLM SRPs and Forest Service RSUAs would be the same as Alternative A; however, in PHMAs, those impacts would have to be mitigated for permits to be approved. Mitigation actions could be reduction of noise, habitat disturbance, re-locating an event or changing the time when and event could occur—all of which could reduce disturbance or disruption to Greater Sage-Grouse life cycles.

Impacts to Greater Sage-Grouse from not designating new ACECs/SIAs for Greater Sage-Grouse conservation would be the same as Alternative D.

Impacts to Greater Sage-Grouse from OHV "open" areas would be the same as Alternative B, except for the Poison Spider OHV Park which would be the same as Alternative A.

Impacts to Greater Sage-Grouse from limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative A.

Impacts from avoiding areas within 1.9 miles of the perimeter of occupied Greater Sage-Grouse leks for new and primary roads, and prohibiting the construction of other new roads within 0.6 miles of occupied leks would provide sufficient buffer distances to prevent population declines from the presence of roads. Holloran (2005) determined that 1.9 miles from a main haul road was the minimum distance from leks where population declines did not occur, depending on traffic volume. Lower volume roads require a smaller buffer distance recommended by Holloran (2005) of 0.6 miles. Sage-grouse may avoid suitable habitat as the density of roads increases (Walker et al. 2007). Increased predation and collisions with vehicles are other threats to Greater Sage-Grouse from new road construction. Buffer distances would help protect Greater Sage-Grouse from impacts from roads, but habitat loss could impact Greater Sage-Grouse ability to migrate from leks to nesting and early brood rearing habitat. Availability of edge habitat from roads for predators within 0.6 miles of occupied leks could increase the threat of predation. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction.

Impacts to Greater Sage-Grouse from road upgrades would be the same as Alternative B. Impacts to Greater Sage-Grouse from limiting route construction to realignments of existing routes in PHMAs would be the same as Alternative B. The 5% disturbance limit would apply under Alternative D, which could result in further habitat loss and fragmentation, leading to inadequate forage, shelter, or breeding habitat. Impacts to Greater Sage-Grouse could also occur from displacement and physiological stress from human presence and activity during sensitive life stages. Roadways provide thoroughfares and areas that attract predators, which could increase predation on sage-grouse (Connelly 2004).

Impacts to Greater Sage-Grouse habitat from restoring roads or trails not designated in travel management plans, reseeding closed roads or trails within PHMAs would be the same as Alternative B.

Impacts to Greater Sage-Grouse habitat from using ESD potential vegetation composition and structure within PHMAs and GHMAs would be the same as Alternative B, but would apply to a larger area 11,531,340 acres (PHMAs and GHMAs), than Alternative B (5,000,400 acres).

Impacts to Greater Sage-Grouse habitat from vegetation treatments that would not reduce sagebrush canopy cover to less than 15% in nesting and winter habitat in PHMAs would be the same as Alternative B. Limiting this to northeast Wyoming could ensure that this management would be appropriate to the conditions inherent to the local environment and could allow for effective results from vegetation treatments and providing varied structure of sagebrush habitat.

Impacts to Greater Sage-Grouse from vegetation treatments for sagebrush habitat in PHMAs would be the same as described in Alternative D.

Reclamation of Greater Sage-Grouse habitat in accordance to the Wyoming Reclamation Policy (2009a) would provide sufficient restoration of habitat following oil, gas, and other surface disturbing activities, the same as Alternative A. In addition, the protocol in Appendix A would support more specific reclamation of Greater Sage-Grouse and sagebrush habitats, providing restoration of functional habitat for Greater Sage-Grouse. If the protocol is followed, soil erosion and introduction of exotic or invasive plant species could be minimized and the landscape could be reclaimed to the original habitat components and structure to the extent possible. While the initial disturbance would result in habitat loss, sagebrush habitat could be restored over the long term; although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas. Working collaboratively with partners to maintain and enhance Greater Sage-Grouse habitats could provide additional resources to apply to sagebrush management and could affect Greater Sage-Grouse with enhanced habitat and forage. Monitoring the treatments could provide feedback to whether the treatments were successful and if changes should be made in the approach to methods or timing in the area.

Impacts to Greater Sage-Grouse from resting treated areas from grazing would be the same as Alternative A.

Developing and implementing monitoring of Greater Sage-Grouse habitats and populations to assess the effectiveness of conservation measures would provide valuable information in showing whether conservation efforts are succeeding in ensuring the health and vitality of Greater Sage-Grouse populations within the planning area. Keeping track of the effectiveness of the protective measures implemented in the LUP Amendments and other management implemented throughout the state would provide current information that would inform wildlife managers if more stringent management is necessary to protect the species, or if the new management is sufficient to prevent listing the species to the Endangered Species List.

Impacts to Greater Sage-Grouse from restoration of sagebrush habitat would be the same as Alternative B. Impacts to Greater Sage-Grouse from the use of native and non-native plant seeds would be the same as Alternative D.

Impacts to Greater Sage-Grouse from managing post ES&R and BAER areas and altering existing seedings would be the same as Alternative B.

Impacts to Greater Sage-Grouse from giving priority for implementing specific sage-grouse habitat restoration and establishing seed harvest areas would be the same as Alternative B.

Impacts to Greater Sage-Grouse from vegetation treatment planning would be the same as Alternative C.

Impacts to Greater Sage-Grouse from grasshopper and cricket control would be the same as Alternative A; however, working collaboratively with partner agencies to maintain and enhance Greater Sage-Grouse habitat in PHMAs could reduce the effects to Greater Sage-Grouse from treatment for insects.

Impacts to Greater Sage-Grouse from wild horse management would be the same as Alternative B.

Impacts to Greater Sage-Grouse from designing and implementing fuels treatments, restoring and recovering burned areas and fuels treatments, managing post fuels management, and fire suppression areas within PHMAs would be the same as Alternative B.

Impacts to Greater Sage-Grouse using wildland fire, prescribed fire, and fire suppression techniques would be the same as Alternative A.

Impacts to Greater Sage-Grouse from the use of monitoring plans within PHMAs would be the same as Alternative B.

Under the Proposed LUP Amendments, the BLM and Forest Service could limit the density of oil and gas or mining activities to no more than an average one disruptive activity to occur within 640 acres within PHMAs (core only); the combined value of surface disturbance (existing and proposed) may not exceed 5% loss. Holloran's (2005) study showed that male Greater Sage-Grouse were negatively influenced when well densities exceeded one per 640 acres. This level of density and development should allow for a minimal amount of disturbance of Greater Sage-Grouse from disruptive activities and prevent decreases in populations from displacement and habitat loss and fragmentation. For PHMAs (connectivity only), all surface disturbance (any program area) would be limited to no more than 5% of PHMAs (core only) per 640 acres using the DDCT process described in Appendix D. For PHMAs (connectivity only), density of development could exceed one within 640 acres in these areas. Leks have been shown to go inactive when well pad densities exceed one per 640 acres. This would result in birds abandoning leks or other habitat and relocating to other, possibly lower quality habitat. Habitat fragmentation could also occur from the possible higher well density, preventing the movement of Greater Sage-Grouse between seasonal habitat areas.

Impacts to Greater Sage-Grouse from using mitigation would be the same as described in Alternative A.

Under the Proposed LUP Amendments, surface disturbing activity or surface occupancy would be prohibited within 0.6 miles of occupied Greater Sage-Grouse leks inside PHMAs, and would be prohibited or restricted within 0.25 miles of occupied Greater Sage-Grouse leks outside of PHMAs, which could protect up to 337,860 acres of habitat (Map 2-3). Declines of Greater Sage-Grouse populations following energy development have been shown through numerous scientific studies (Braun 1986, Remington and Braun 1991, Braun et al. 2002, Holloran 2005, Walker et al. 2007). Buffer distances from 0.5 to two miles from oil and gas infrastructure have been shown to be inadequate to prevent declines of birds from leks (Walker et al. 2007). Studies have shown that greater distances, anywhere from two to four miles, are required for viable Greater Sage-Grouse populations to persist (Connelly et al. 2000, Holloran and Anderson 2005, Walker et al. 2007).

Surface disturbing activity or surface occupancy would be prohibited or restricted on 160,630 acres, which would further help to protect sage-grouse habitat from construction and development activities. Impacts to Greater Sage-Grouse would be approximately the same as Alternative A. It is assumed that most of the

desirable lek habitat is within PHMAs (core only), so increasing restrictions outside PHMAs (core only) would provide lower impacts than within PHMAs (core only). Declines of Greater Sage-Grouse populations following energy development have been shown through numerous scientific studies (Braun 1986, Remington and Braun 1991, Braun et al. 2002, Holloran 2005, Walker et al. 2007) and a buffer distance for oil and gas infrastructure of 0.25 miles has been suggested to be insufficient (Walker et al. 2007). While the Proposed LUP Amendments provide a buffer area from surface disturbance or occupancy; it is not of a distance that is recommended by current science and may force sage-grouse away from leks to other areas of lower quality habitat and smaller populations of lekking birds. The result of lek disturbance and abandonment is lower reproductive rates of Greater Sage-Grouse, and reduction of sage-grouse populations. These differences in lek area protections is one piece of the Wyoming Statewide core area strategy that weaves the many on-going existing land uses and activities with the new science, information, and data to conserve the Greater Sage-Grouse in Wyoming. In many instances the areas considered GHMAs have many existing activities and disturbances located within the breeding, nesting, brood-rearing, and wintering habitats, and these same areas within PHMAs (core only) do not to the same degree of disturbances. Implementing a larger lek NSO in an area that is already developed will only achieve the protections to development for new activities. Those leks are still subjected to ongoing existing disturbances due to human presence. Therefore the protections of a larger NSO on leks not experiencing as much existing disturbance will have a higher success rate.

Applying seasonal restrictions during March 15 to June 30 to surface disturbing and/or disruptive activity during breeding, nesting, and early brood-rearing season within PHMAs (core only) would allow for no disturbance or disruption to occur in PHMAs (core only) during this timeframe. This management could prevent stress from noise and human presence to support Greater Sage-Grouse in successful nesting and hatching rates, and raising healthy chicks. Female Greater Sage-Grouse will avoid nesting in areas of development or where disturbing or land-clearing activities occur; such as oil and gas development, roads, urban areas, or cropland (Aldridge and Boyce 2007). Applying seasonal restrictions during March 15 to June 30 to surface disturbing and/or disruptive activity during breeding, nesting, and early brood-rearing season within four miles of a lek in PHMAs (connectivity only) could prevent habitat loss and disturbance within the four mile buffer during that timeframe. Greater Sage-Grouse within the buffered area would benefit from the seasonal closure to disturbance and protection from noise and human activities. The same seasonal restrictions would apply to GHMAs, except there would be a two-mile buffer around leks, providing less protection than described above, the same as described under Alternative A.

Prohibiting surface disturbing and/or disruptive activities in Greater Sage-Grouse winter concentration areas within PHMAs and GHMAs from December 1 to March 14 would affect Greater Sage-Grouse as described under Alternative A.

Impacts to Greater Sage-Grouse from minimizing impacts from predators would be the same as Alternative D.

Restricting noise at the perimeter of sage-grouse leks to not exceed 10 dBA above background noise could reduce disturbance to Greater Sage-Grouse. Studies conducted on Greater Sage-Grouse indicate that noise could adversely affect the communication abilities of strutting males (LaGory et al. 2001; Dantzker et al. 1999). Holloran (2005) and Blickley et al. (2012) suggest that noise emitted from drilling operations could reduce lek attendance.

Impacts to Greater Sage-Grouse from the use of adaptive management would be the same as Alternative B, except that the additional use of soft and hard triggers and other tools could provide more responsive and focused solutions to population declines and the ability to effectively apply corrective management.

4.15 TRANSPORTATION AND ACCESS MANAGEMENT

This section presents potential impacts on transportation and access from implementing management actions presented in Chapter 2. Existing conditions concerning transportation and access are described in Chapter 3.

The BLM's transportation program manages legal access to and across public lands utilized for recreation, renewable and nonrenewable energy development, range management, public access, and communication site management. This section describes impacts to transportation and access issues, including OHV use, from the decisions described in Chapter 2 that would amend the RMPs in the planning area for the protection of sage-grouse and sagebrush habitat. Specifically, this analysis will determine whether the implementation of management actions influences or modifies the location, size, or design of a potential transportation or access proposal or, in some cases, precludes a proposal from being approved.

4.15.1 Impact Indicators

Indicators of impacts on travel and transportation management are as follows:

- Change in the types of allowable transportation activities
- Change in the acreages designated as open, limited, or closed to motorized travel
- Change in the number of acres where new authorized road development would be allowed.

4.15.2 Assumptions

The analysis is based on the following assumptions:

- ROW applications for energy-related transportation facilities (e.g., roads, pipelines) are anticipated to increase.
- Interest in community expansion and transportation needs is anticipated to increase.
- Casual OHV use will continue to increase.
- Lands would be open to motor vehicle access for emergency purposes such as search and rescue and fire-fighting, regardless of the OHV designation or other restrictions.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.15.3 Alternative A

Development of transmission lines within new and existing utility corridors would reduce the visual quality of the landscape, potentially deteriorating views and the open character of the landscape, which is part of the experience sought after by many OHV enthusiasts.

Allowing wind energy development in sage-grouse core habitat areas, except in areas that are currently unavailable for such development (Map 2-29) could increase traffic and congestion in those areas from maintenance and construction vehicles. Visual impacts from wind turbines could also deteriorate views sought after by OHV enthusiasts, making some areas less popular for travel.

Land tenure adjustments, such as acquisitions, could serve to benefit the overall management of the transportation and access program. These actions would help facilitate transportation systems by providing for a more contiguous public land base.

Management actions that allow range improvement projects, such as modifying or building fences and water developments could promote access to areas not previously available through road construction for these improvements.

Implementing management actions for vegetation and soils would place land use restrictions on some areas. Achieving high species diversity and the Standards for Rangeland Health (BLM 1997a) for vegetation and preventing or minimizing soil erosion could result in the relocation or redesign of transportation systems. These potential impacts would be small scale and localized in sensitive vegetation and sensitive soils areas.

The minerals program would have a very large impact on the transportation and access program. The development of roads and transportation systems required for oil, gas, and mineral development would increase travel and access in those areas. In addition, areas closed to mineral materials (472,800 acres), locatable minerals (1,892,620 acres) and non-energy, solid leasable minerals (261,000 acres) could limit or restrict travel and access in those areas. Travel in these areas would be limited to existing roads and trails. Minerals management actions, because they are so numerous in specific parts of the planning area, would potentially affect the location of subsequent transportation systems.

Allowing dispersed camping and other recreation-related demands on public lands could increase the need for access to these areas.

Areas open to OHV use would provide motorized access to much of the decision area. While most motorized use within these areas would use the designated roads that are present on the ground, the availability of cross-country use would allow motorized access regardless of the presence of a route. Limiting use to designated routes would reduce the ability to access any area using motorized means. However, the designated routes in these areas would provide for motorized access to most of these areas, while non-motorized access would allow access to areas beyond the designated routes.

Areas where surface disturbing activities are prohibited (Map 2-1), including buffer areas around sage-grouse leks, nesting areas, and other sensitive areas, would limit travel and access to designated roads and trails. Surface disturbing activities under this alternative are prohibited on 68,550 acres and restricted on 93,580 acres.

4.15.4 Alternative B

ROW management actions that allow access to valid existing rights (including new ROWs or SUAs associated with valid existing rights) which cannot be accessed by existing roads, would allow development of new roads. Although new roads would be constructed to the absolute minimum standard necessary, allowing construction of new roads would increase access to areas that may not have been previously accessible by motorized vehicles.

Impacts from land tenure adjustments, such as acquisitions, would have the same impacts as those described in Alternative A.

Impacts from management actions that allow range improvement projects would be the same as those described in Alternative A.

Impacts from implementing management actions for vegetation and soils would be the same as those described in Alternative A.

As with Alternative A, the minerals program would have a very large impact on the transportation and access program. The development of roads and transportation systems required for oil, gas, and mineral development would increase travel and access in those areas. Areas closed to mineral materials (6,992,690 acres), locatable minerals (6,879,620 acres) and non-energy solid leasable minerals (6,992,690 acres), could limit or restrict travel and access in those areas. Travel in these areas would be limited to existing roads and trails. Compared with Alternative A, the number of acres closed to minerals activities is much larger, expanding the area where impacts could occur. Minerals management actions, because they are so numerous in specific parts of the planning area, would potentially affect the location of subsequent transportation systems.

Impacts from recreation management would be the same as those described in Alternative A.

Impacts from travel management would be the same as those described in Alternative A, except that roads, primitive roads, and trails in priority habitat not designated in travel management plans would be restored, removing them from travel and access uses.

Not allowing upgrading of existing routes within priority sage-grouse habitat that would change route category (road, primitive road, or trail) or capacity unless it is necessary for motorist safety, or eliminates the need to construct a new road, could limit travel and access, especially in areas where use of these roads is increasing.

Impacts from management of fish and wildlife habitat and Special Status Species would be the same as those described in Alternative A.

4.15.5 Alternative C

Impacts from ROW management actions that allow access to valid existing rights would be the same as those described in Alternative B.

Impacts from land tenure adjustments, such as acquisitions, would have the same impacts as those described in Alternatives A and B.

Impacts from management actions that allow range improvement projects would be the same as those described in Alternatives A and B.

Impacts from implementing management actions for vegetation and soils would be the same as those described in Alternatives A and B.

As with Alternatives A and B, the minerals program would have a very large impact on the transportation and access program. The development of roads and transportation systems required for oil, gas, and mineral development would increase travel and access in those areas. Areas closed to mineral materials (6,992,690 acres), locatable minerals (6,879,620 acres) and solid leasable minerals (6,992,690 acres), could limit or restrict travel and access in those areas. Travel in these areas would be limited to existing roads and trails. Compared with Alternative A, areas closed to minerals activities are much larger, expanding the area of impact. Minerals management actions, because they are so numerous in specific parts of the planning area, would potentially affect the location of subsequent transportation systems.

Impacts from recreation management would be the same as those described in Alternatives A and B.

Designating large ACECs to preserve, protect, conserve, restore, and sustain sage-grouse populations and their habitat could restrict travel and access in these areas, depending on where they are located and the specific management actions that would be employed for each ACEC.

Impacts from travel management would be the same as those described in Alternative B except that prohibiting new road construction within four miles of active sage-grouse leks, and avoiding new road construction in sage-grouse priority and general habitat, would restrict travel and access in these areas.

Not allowing upgrading of existing routes within priority and general sage-grouse habitat that would change route category (road, primitive road, or trail) or capacity unless, it is necessary for motorist safety, or eliminates the need to construct a new road, could limit travel and access, especially in areas where use of these roads is increasing.

Applying a seasonal restriction on exploratory drilling that prohibits surface-disturbing activities during the nesting and brood-rearing season in all occupied sage-grouse habitat, including vehicle traffic and other human presence, would limit travel and access to these areas at the specified times. This also applies to areas outside priority habitat and connectivity habitat areas.

4.15.6 Alternative D

Development of transmission lines within new and existing utility corridors would reduce the visual quality of the landscape, potentially deteriorating views and the open character of the landscape, which is part of the experience sought after by many OHV enthusiasts.

Impacts from ROW management actions that allow access to valid existing rights would be the same as those described in Alternatives B and C.

Impacts from land tenure adjustments, such as acquisitions, would have the same impacts as those described in Alternatives A, B, and C.

Impacts from management actions that allow range improvement projects would be the same as those described in Alternatives A, B, and C.

Impacts from implementing management actions for vegetation and soils would be the same as those described in Alternatives A, B, and C.

As with Alternatives A, B, and C, the minerals program would have a very large impact on the transportation and access program. The development of roads and transportation systems required for oil, gas and mineral development would increase travel and access in those areas. Areas closed to mineral materials (472,800 acres), locatable minerals (1,879,620 acres) and solid leasable minerals (261,000 acres), could limit or restrict travel and access in those areas. Travel in these areas would be limited to existing roads and trails. Compared with Alternative A, acres closed to minerals activities are the same. Minerals management actions, because they are so numerous in specific parts of the planning area, would potentially affect the location of subsequent transportation systems.

Impacts from recreation management would be the same as those described in Alternatives A, B, and C.

Impacts from travel management would be the same as those described in Alternative A and B except that prohibiting new road construction within 0.25 miles, rather than four miles in Alternative B, of active sage-grouse leks, and avoiding new road construction in sage-grouse core, connectivity, and general habitat, would restrict travel and access in these areas.

Allowing upgrading of existing routes within core, connectivity, and general sage-grouse habitat would contribute to increased travel and access within these areas.

Allowing natural deterioration of roads within core, connectivity, and general sage-grouse habitat would eventually limit travel and access, however the use of, and need for, travel and access in these areas would dictate the rate at which these roads would deteriorate.

4.15.7 Proposed Land Use Plan Amendments

Impacts from development of transmission lines within new and existing utility corridors would be the same as those described in Alternatives A and D.

Impacts from ROW management actions that allow access to valid existing rights would be the same as those described in Alternatives B, C, and D.

Impacts from land tenure adjustments, such as acquisitions, would have similar impacts as those described in Alternatives A, B, C and D.

Impacts from management actions that allow range improvement projects would be the same as those described in Alternatives A, B, C, and D.

Impacts from implementing management actions for vegetation and soils would be the same as those described in Alternatives A, B, C, and D.

As with Alternatives A, B, C, and D, the minerals program would have a very large impact on the transportation and access program. The development of roads and transportation systems required for oil, gas, and mineral development would increase travel and access in those areas. Areas closed to mineral materials (472,800 acres), locatable minerals (2,907,680 acres) and non-energy, solid leasable minerals (483,420 acres), could limit or restrict travel and access in those areas. Travel in these areas would be limited to existing roads and trails. Compared with Alternative A, acres closed to minerals activities are similar, with the exception of locatable minerals. Minerals management actions, because they are so numerous in specific parts of the planning area, would potentially affect the location of subsequent transportation systems.

Impacts from recreation management would be the same as those described in Alternatives A, B, C, and D.

Impacts from travel management would be similar to those described in Alternative A. In addition, avoiding the construction of new primary and secondary roads within 1.9 miles of sage-grouse leks and prohibiting the construction of roads within 0.6 miles of sage-grouse leks within PHMAs could restrict travel and access in these areas.

Not allowing upgrading of existing routes within PHMAs would contribute to decreased travel and access within these areas.

Allowing natural reclamation of roads within PHMAs would eventually limit travel and access, however the use of, and need for, travel and access in these areas would dictate the rate at which these roads would be reclaimed.

4.16 VEGETATION

This section presents potential impacts on vegetation and vegetation management from implementing management actions presented in Chapter 2. Existing conditions concerning vegetation communities and vegetation management are described in Chapter 3.

4.16.1 Impact Indicators

Indicators of impacts on vegetation resources are as follows:

- Acres and condition of native vegetation communities
- Degree/magnitude/level of connectivity between sagebrush communities
- Degree/magnitude/level of surface disturbance and vegetation removal
- Amount and condition of riparian and wetland vegetation
- Change in the likelihood for noxious weed or invasive annual grass introduction or spread
- Change in the amount or density of noxious weed or invasive annual grasses.

4.16.2 Assumptions

The analysis is based on the following assumptions:

- Current trends in plant succession and vegetation health would continue.
- Long-term vegetation impacts are considered a 20 year or longer time frame.
- Grassland and shrubland communities would be maintained with a mix of species composition, cover, and age classes.
- Any activities that affect the ecological condition of the watershed and its vegetative cover would directly or indirectly affect the aquatic environment. The degree of impact attributed to any one disturbance or series of disturbances is influenced by location within the watershed, time and degree of disturbance, existing vegetation, and hydrologic condition.
- As more monitoring and survey data become available, it is possible that additional populations of existing special status plant species may be found.
- Management of listed, proposed, and candidate threatened and endangered plant species is subject to the ESA of 1973.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.16.3 Alternative A

Vegetation resources would primarily be impacted by different forms of surface disturbance and disruptive activities that would be allowed within the planning area. Examples of such activities include, but are not limited to, oil and gas development, wind energy development, access road construction, solid mineral

development, recreational activities, and livestock grazing. These types of activities would result in both short-term and long-term impacts to small localized areas as well as possibly larger areas from the removal or degradation of vegetation resources. Examples of these impacts include, disturbed soil, soil compaction, soil removal, vegetation removal, fractured vegetation communities, modified plant community structure and diversity, increased soil erosion, decreased vegetation cover, increased dust on plants (reducing photosynthesis), and increased surface runoff. These impacts would result in various levels of decreases to plant community health, diversity, and impact habitats that are susceptible to invasive/noxious weeds. Increases in invasive and noxious weeds would result in a decline in native species, compromising the overall habitat health (through ecological processes). Long-term impacts would mostly be associated with the installation of access routes, permanent structures, and vehicle travel.

Within the planning area, 285,930 acres would be managed as ROW exclusion areas (Map 2-9) and 2,460,340 acres would be managed as ROW avoidance areas, which would reduce surface disturbing activities in these areas that could degrade plant community health and continuity. Prohibiting new corridor designations in Bates Hole (Casper Field Office) and South Bighorns/Red Wall MA (Casper Field Office), and restricting new transmission lines to existing routes and designated corridors within sage-grouse habitat would maintain vegetation health by reducing surface disturbing activities associated with ROW development such as roads development, vehicle travel, and ROW maintenance activities within these areas. Surface disturbances by wind energy development would be restricted on 2,438,850 acres and closed on 424,820 acres (Map 2-29), thus reducing potential damage to vegetation habitat. Surface disturbing activities and associated impacts from wind energy would occur from the projected development of the 1,254 wind energy turbines to be constructed across the planning area through 2020. The surface disturbing activities for wind energy development would directly reduce vegetation and reduce plant community health through habitat fragmentation, and possibly introduce or spread noxious weeds. Where surface disturbance would be allowed to occur, mitigation measures associated with such actions would reduce potential impacts and maintain ecological processes necessary for plant community health. Reclamation efforts would provide additional measures to reduce the overall impacts caused by surface disturbance. In addition, the BLM and Forest Service would work with project proponents to locate their projects in sites that minimize impacts to sensitive resources. Avoidance buffers for new MET towers could reduce surface disturbing activities that degrade or remove vegetation in sagebrush obligate species' habitats and near occupied sage-grouse leks.

Vegetation objectives as set forth in the Wyoming Standards for Healthy Rangelands (BLM 1997a) and Forest or Grassland Management Plans (Forest Service) would be achieved by adjusting distribution, intensity, and stocking rates for livestock. Construction of water developments would aid in livestock distribution and improve watershed condition and sage-grouse habitat through reducing impacts from cattle grazing, such as loss of plant biomass, trampling of vegetation, soil compaction, and invasive species introduction. Allowing stock driveways (SDW) to provide emergency use for relief from fire, drought, and other natural causes and/or to meet management objectives could also increase or maintain vegetative community health as impacts from grazing would be distributed over a larger area and possibly in areas more resistant to grazing. Allowing livestock trailing use to occur only within 0.5 miles of the mapped centerline of SDWs would increase surface disturbance from livestock along the 0.5-mile area as well as reduce impacts from grazing outside of the mapped centerline (Kemmerer Field Office). Prohibiting placement of salt and/or other supplements for livestock near water, wetlands, and riparian areas (distance and types vary by Field Office/National Forest/National Grassland) could reduce vegetation loss or degradation from livestock grazing and wildlife in these sensitive areas, as well as improve distribution of grazing and associated impacts across allotments. Modifying fencing standards could reduce the amount of surface disturbance and vegetation loss caused when installing new fences or modifying existing fencing to meet fencing standards. Livestock grazing would be reduced for two years (one year before treatments for Rock Springs Field Office) following vegetation treatments, which could increase vegetation growth and forage for wildlife.

Vegetation would be removed or degraded initially on approximately 130,330 acres and would be impacted over the long term on 39,050 acres from the projected development of 13,653 oil and gas wells and 2,758 CBNG wells. This development would be throughout the planning area except in 871,780 acres of sage-grouse core and connectivity habitat that are unavailable for leasing (Map 2-4), which would restrict these surface disturbing impacts and help maintain vegetation connectivity near these areas. Allowing oil and gas leasing development would increase surface disturbing activities such as the use of heavy equipment during well development or maintenance, which could remove/damage vegetation, compact soil, and increase surface runoff. Forest Service fluid mineral lease sizes could be reduced when minimum lease sizes are not applied in sage-grouse core habitat areas. These leases could be smaller and could increase the amount of vegetation impacted directly by surface disturbing activities in these areas as more could occur within a given area.

Exploration and development associated with oil and gas activities, and the development of associated facilities such as power lines, compressors, pipelines, and fuel tanks would increase surface disturbance and the use of heavy equipment in sage-grouse habitat areas which would reduce plant community health by directly removing vegetation and fragmenting habitat. These surface disturbing activities would contribute to the modification of the composition and structure of vegetation communities within the developed areas. Additionally, the use of equipment would increase the chance for noxious weed proliferation.

Exploration and development of coal resources, other solid leasable minerals, and mineral materials would create similar impacts on vegetation through increased surface disturbing activities that would remove and reduce plant community health. Under this alternative, 261,000 acres would be closed to non-energy, solid mineral development, and 472,800 acres would be closed to mineral material sales and permits (Maps 2-24, 2-19, and 2-14), which would reduce surface vegetation loss and compaction from surface disturbing activities. Based on the coal screening process and CDPA, coal leasing would be open in Casper, Kemmerer, Pinedale, Rawlins, and Rock Springs Field Offices as well as the BTNF Planning Unit, which would result in surface disturbing activities that would remove and degrade vegetative resources.

Portions of sage-grouse core habitat would be withdrawn from mineral entry. This would eliminate surface disturbing activities associated with locatable mineral development in these areas and help maintain plant community health. In areas that currently have development within the core area boundary and are subsequently exceeding the 5% disturbance thresholds, strategies to eliminate or reduce those disturbances and perhaps encourage faster reclamation. These strategies should be discussed with the project proponent before additional disturbance may be authorized. In these instances the BLM/Forest Service and the State of Wyoming will work with the project proponent to determine the course of action that should be taken. Allowing sage-grouse core habitat areas to be open to mineral material exploration, sales, and free use permits (as shown on Map 2-14) would increase the potential for vegetation removal/degradation, as surface disturbing activities could increase in these areas. Surface disturbing activities could occur in sage-grouse core habitat areas and could increase negative impacts to vegetation in areas where leasing of non-energy leasable minerals would be considered. Sodium and phosphate leasing would not be considered in the Raymond Mountain WSA, Rock Creek/Tunp, and Bear River Divide management areas. These restrictions would reduce surface disturbing activities from sodium and phosphate development and reduce associated impacts to vegetation resources.

Exceptions to lease stipulations could potentially allow for surface disturbing activities that would otherwise be prohibited or restricted. Increased surface disturbing activities associated with mineral development, would impact vegetation through use of mechanical equipment, causing the loss of vegetation from activities such as ground clearing. These activities would also likely impact vegetation through soil compaction, soil erosion, dust, and habitat fragmentation associated with surface disturbing activities and development.

Reclaiming surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would help to maintain and improve the overall health and function of vegetation communities in disturbed areas. The reclamation process for sagebrush could take 20-30 years to reach the pre-disturbance state. This would directly impact vegetation by decreasing surface disturbing activities that remove vegetation and fragment habitat, and would reduce ecological functions by providing mitigation measures intended to promote healthy diverse vegetation communities. Using certified weed free seed to rehabilitate areas would positively impact vegetative communities by reducing the open niches available to noxious/invasive plant species. Vegetation treatments for rehabilitation and restoration would focus on native plant composition, protection, and sustainable ecosystems. These treatments could increase overall vegetative community health and resistance to surface disturbance impacts.

Fuel treatments using fire, mechanical, chemical, and biological methods would be used to reduce fuel load and convert decadent stands of brushlands (Rawlins RO and Rock Springs). These treatments could have negative impacts from surface disturbing activities as more ground is disturbed and surface runoff increases. Positive impacts on vegetation by fuel treatments would include the reduction in fuel loads that cause high intensity fires and converting brushlands to other preferred vegetative groups. Impacts from surface disturbing activities associated with fire suppression would be reduced by prohibiting the use of earth moving equipment in paleontological/cultural areas and limiting equipment and techniques to existing roads and trails in riparian/wetland, big game crucial winter range, sage-grouse leks, areas of highly erosive soils, and special plant species habitat (Casper Field Office, Rock Springs Field Office, MBNF and TBNG).

Change in vegetative cover and change in vegetative composition ESR in burned areas is a stop gap measure to manage post-fire threats to human life and safety and to preclude further damages to critical natural and cultural resources as a result of wildfire damages. ESRs are planned actions performed by burned area emergency response teams within 1 year of wildfire containment to stabilize and prevent unacceptable degradation of natural and cultural resources, to minimize threats to life or property from the impacts of a fire, or to repair, replace, or construct physical improvements to prevent degradation of land or resources. Burned area rehabilitation is undertaken within 3 years of wildfire containment to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by fire (BLM 2004i).

Following a wildfire, ESR stabilizes and prevents unacceptable degradation of natural and cultural resources. Post-wildfire ESR assists in stabilizing soils, replenishing the seed bank, and addressing weed threats. These activities are typically designed to restore the vegetative cover and to assist post-fire recovery. Post wildfire cheatgrass conversion is one of the biggest challenges across the planning area. If successful, ESR will reduce erosion, aid in reducing cheatgrass invasion, and maintain appropriate fire return intervals. ESR benefits both upland and riparian vegetative communities.

Greater Sage-Grouse priority habitat and general habitat restrictions do not apply. ESR would be guided by individual field office's fire management plans and LUPs. A greater acreage of sagebrush may be burned under this alternative and thus require ESR. More sagebrush may be removed by fire and replaced by early seral species.

The lands within the OHV "open" areas within Rawlins, Rock Springs, and Casper field offices are primarily devoid of vegetation as they are either sand dunes or reclaimed mining areas. OHV use in these areas would have minimal if any impact on vegetation. Allowing cross-country OHV use in these areas could attract more OHV users over other areas, which could likely decrease the amount of surface disturbances on vegetation within the planning area. Surface disturbing impacts from motorized travel could be reduced as motorized travel would be limited to existing roads, primitive roads, and trails, until such time as travel management planning is complete and routes are designated or closed. Additionally, the use of OHVs could also result in an increase in the proliferation of invasive weeds, further altering and

degrading the vegetative community and ecological processes. Reclaiming and/or closing unauthorized, redundant, unnecessary and/or roads/trails eroded beyond a reasonable level would reduce negative surface disturbance impacts from recreation and other uses on these roads and trails and help protect vegetation in these areas (Casper Field Office, Rawlins Field Office, and Rock Springs Field Office).

Prohibiting surface disturbing activities within 0.25-miles (0.75 miles for Bates hole and Fish Creek/Willow Creek and two miles for MBNF from March 1 – June 30) of occupied sage-grouse leks within the Pinedale Field Office, Newcastle Field Office, Rawlins Field Office, Jack Morrow Hills area of the Rock Springs Field Office (68,550 total acres), MBNF, and TBNGs (two-mile buffer and only for oil and gas) would reduce the overall level of degradation to plants from surface disturbances resulting from new permitted activities.

Avoiding surface disturbing and disruptive activities within sage-grouse nesting/early brood-rearing habitat from March 15 (March 1 in the Rawlins and Rock Springs Field Offices) through July 15 (and prohibiting such activities in the Jack Morrow Hills area of the Rock Springs Field Office from March 15 through July 15) within two miles of sage-grouse leks would reduce the level of development in these areas during this time which would reduce impacts to plants during the critical part of the growing season (Map 2-1). Prohibiting construction, gravel mining operations, and drilling of water wells within two miles of active display grounds from March 1 to June 15 (TBNG) and within two miles of sage-grouse breeding complexes from March 1 to June 30 (MBNF) would reduce surface disturbing activities, this would reduce soil erosion, the spread of noxious weeds, and impacts to overall ecosystem health by eliminating new surface disturbing activities during the winter and spring when vegetation growth is most important.

4.16.4 Alternative B

Impacts from ROW management actions would be similar to those under Alternative A, except vegetation removal, degradation, and compaction would be reduced in all sage-grouse priority habitat areas, as they would be managed as ROW/SUA exclusion areas (5,271,440 acres; Map 2-10), and all sage-grouse general habitat areas would be managed as ROW/SUA avoidance areas (6,357,180 acres; Map 2-10). However, there is the potential that vegetation health could be reduced from maintenance activities and upgrading of existing transmission structures. Excluding new BLM ROWs and Forest Service SUA permits as well as relocating (if possible) existing designated ROW corridors within or crossing sage-grouse priority habitat would eliminate surface disturbance impacts from ROWs in sage-grouse priority habitat, which would increase vegetation quantity and enhance habitat quality in these areas. If relocation is not possible, co-locating ROWs or SUAs within existing ROWs or SUAs would minimize new surface disturbances and associated impacts.

Impacts from wind energy development would greatly be reduced compared to those under Alternative A, as areas closed to wind energy development would increase to 5,033,240 acres. It is projected that 127 wind turbines could be built under these management actions which could reduce vegetation through surface removal and habitat fragmentation.

Impacts on vegetation from livestock grazing would be reduced compared to Alternative A, as a light grazing strategy would be incorporated (20-30% forage allocation for livestock) on allotments not meeting standards within sage-grouse priority habitat as well as using conservation plan development to modify grazing management to meet seasonal sage-grouse habitat requirements, which would reduce the negative impacts from grazing. This would be accomplished by changing grazing season of use, timing, number of AUMs, and cattle distribution, which could also decrease rehabilitation time. Impacts from grazing in sage-grouse priority habitat could be reduced in allotments where retirement of grazing privileges would be an option, when the current permittee would be willing to retire grazing on all or part of an allotment, which would reduce grazing numbers and associated impacts. Including terms and conditions (e.g., season of use,

numbers of livestock, distribution of livestock) on grazing permits/leases to assure plant growth requirements are met would reduce impacts from livestock grazing and could maintain vegetative community health.

Impacts from riparian management actions would be similar to Alternative A as riparian areas and wet meadows within sage-grouse priority and general habitat would be managed to meet PFC (or similar methodology for the Forest Service) and to maintain a component of forbs with diverse species richness relative to site potential. Water developments for diversion from springs or seep sources in sage-grouse priority habitat could reduce surface disturbances from grazing and wildlife around springs and seeps by redistributing them around the diversions. Impacts from grazing would also be eliminated for two years following vegetation treatments (unless vegetation recovery dictates otherwise) to help vegetation regenerate and increase in overall health. Vegetation rehabilitation in sage-grouse priority habitat would be similar to Alternative A with intensive rehabilitation and restrictions for sage-grouse priority habitat and surrounding areas. Not allowing grasshopper or cricket control in priority habitat unless it is beneficial to sage-grouse could increase negative impacts to vegetation from pests in priority areas compared to Alternative A as more vegetation could be lost to pests.

Maintaining sagebrush canopy cover to 15% or more (unless fuels management required less) could reduce the amount of sagebrush habitat treated which could maintain vegetation health but could allow untreated areas with weeds to continue to deteriorate. Vegetation habitat would be preserved through fuel treatments which would be allowed when it positively impacts sage-grouse habitat (e.g., protection, enhancement, recovery of burned areas, ESR), but would only be allowed in priority habitat within precipitation zones of 12 inches or more. Post fuels management actions could preserve or improve vegetation habitat through temporary or long-term management changes in livestock grazing, with other activities to achieve and maintain desired conditions. In priority habitat, fires would be suppressed to conserve habitat. Fewer acres of sagebrush habitat would be converted to an early seral stage than under Alternative A, thus fewer acres may require ESR. The emphasis on native seed and reestablishment of species-appropriate sagebrush seed would improve habitat quality. In the absence of fire or fuels treatments, this alternative may result in more decadent sagebrush stands with depleted understories. However, the risk of catastrophic fire as a result of fire suppression or exclusion could lead to larger ESR projects for Alternatives B, C, D, and. E

Impacts on vegetation due to oil and gas exploration and development within sage-grouse priority habitat areas would be similar to those identified under Alternative A, except the projected level of well development and associated surface disturbances would substantially decrease helping to reduce damage and loss to vegetation habitat. Vegetation removal and habitat fragmentation would be eliminated in priority sage-grouse habitat, which would be closed to fluid mineral leasing (6,886,890 acres), and in areas in which surface occupancy is prohibited (2,117,160 acres; Map 2-5). Under Alternative B, 11,555 oil and gas wells and 2,154 CBNG wells are projected to be drilled within the planning area (1,423 and 167 respectively within sage-grouse priority habitat). Such development would create an initial disturbance of approximately 104,050 acres and a long-term surface disturbance impact of 33,540 acres, which is a substantial reduction compered to Alternative A. Additionally, the BLM and Forest Service would also work with valid existing lease holders to ensure measurable sage-grouse conservation objectives are included in all project proposals, further reducing impacts on vegetation.

Impacts from geophysical operations could be reduced compared to Alternative A by allowing exploratory information to be obtained in sage-grouse priority habitat areas only by using helicopter-portable drilling, wheeled or traced vehicles on existing roads, or other approved methods, which would reduce surface disturbances and vegetation loss. Impacts on vegetation would also be reduced by not re-offering for lease existing oil and gas leases once they expire in sage-grouse priority habitat areas, thus eliminating activities that degrade vegetation habitat. Impacts on vegetation from coal and other solid mineral leases and mineral materials exploration such as soil compaction, vegetation removal, habitat fragmentation, and habitat loss

would be eliminated compared to Alternative A, as new projects would not be considered within sage-grouse priority habitat. These actions would also reduce the level of surface disturbing activities and associated impacts on vegetation and vegetative communities.

The closure of areas to solid minerals leasing and mineral material disposal and the withdrawal of lands from mineral location would reduce surface disturbing activities from solid mineral exploration and development, compared with Alternative A. Approximately 6,992,690 acres would be closed to non-energy, solid leasable development activities, and mineral materials sales and permits, and 6,879,620 acres would be closed to locatable mineral development, which would reduce habitat fragmentation and loss compared to Alternative A (Maps 2-25, 2-20, and 2-15).

Impacts on vegetation could be reduced compared to Alternative A, through the development of landscape-scale conservation strategies that would protect habitat from fragmentation and conserve ecological processes. Vegetation treatments would enhance vegetation health and composition throughout the planning area by reducing noxious weeds and increasing species richness. Retaining public ownership of sage-grouse priority habitat and seeking to acquire state and private lands with intact subsurface mineral estate could reduce impacts to vegetation by reducing habitat fragmentation and protecting habitat with surface disturbing restrictions.

Prohibiting new connector roads and other roads within 1.9 miles and 0.6 miles, respectively, of the perimeter of occupied sage-grouse leks could result in reduced road development, which would maintain sagebrush habitat continuity and encourage community sagebrush health. Road restoration would be conducted on non-designated roads, primitive roads and trails in priority habitat, which would reduce the impacts from invasive plant species proliferation, soil compaction, and surface water run-off caused by construction, maintenance and the use of the roads for these activities. However, there is a potential that in an effort to avoid lek buffers, the length of some roads may increase. This would impact vegetation by increasing surface disturbances associated with roads and by increasing the potential for invasive species proliferation.

The impacts on vegetation resulting from placing restrictions on surface disturbing activities within sage-grouse nesting and early brood-rearing habitat would be similar to those described under Alternative A, except the restricted area would be increased and the total human-caused surface disturbances would cover less than 3% (up to 19.2 acres per 640 acres) of total sage-grouse habitat and connectivity areas. Surface disturbing activities would not be permitted in sage-grouse priority and connectivity habitats where the surface disturbances exceed 3% until habitat has been restored. Placing a limit on the average amount of allowable surface disturbance could result in the relocation or the redesign of new development projects, and in some cases preclude such projects, to ensure they do not exceed the density restrictions which could reduce impacts to vegetation. Prohibiting surface disturbing activities and surface occupancy within mapped sage-grouse winter concentration areas throughout the planning area would eliminate surface disturbances resulting from new permitted activities within these areas. Because these restrictions are not part of Alternative A, the level of surface disturbance would be reduced resulting in the decreased potential for impacts on vegetation caused from surface disturbing activities. This would reduce habitat fragmentation and help maintain overall vegetation habitat health and ecological processes.

The impacts on vegetation resulting from restricting surface disturbing and disruptive activities within sage-grouse nesting and early brood-rearing habitat would be similar to those identified in Alternative A, except surface disturbing activities would be restricted during the early brood-rearing season in priority habitat (versus within two miles of a sage-grouse lek from March 1 through July 15 under Alternative A). This would also reduce the extent of disturbed areas and the number of potential impacts on vegetation communities caused from surface disturbing activities.

Impacts on vegetation communities from reclaiming surface disturbances in sage-grouse habitats would be similar to those identified in Alternative A, except reclamation efforts would require the implementation of methods for restoring or augmenting functional sage-grouse seasonal habitats to mirror healthy vegetative communities. These actions would reduce the proliferation of invasive species and increase the degree to which the health and function of vegetation communities would be maintained and improved compared to Alternative A.

The impacts on vegetation from OHV use in the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area would be similar to those identified in Alternative A, except the non-sand dune portions of these areas would be managed as "limited to designated roads and trails" which could reduce overall vegetation loss and damage from OHV use. Upgrading of existing routes within sage-grouse priority habitat would not be allowed unless the upgrading would have minimal impact on sage-grouse priority habitat, which would further reduce the potential for damage to vegetation resources, the introduction and spread of noxious weeds, and habitat fragmentation.

4.16.5 Alternative C

Impacts to vegetation from ROW management actions would be similar to Alternative B, except all sage-grouse priority and general habitat areas would be managed as exclusion areas for ROWs and SUAs (11,556,490 acres; Map 2-11) which would decrease vegetation removal, habitat fragmentation and other impacts from surface disturbing activities compared to Alternative A.

Surface disturbing activities such as land clearing, vegetation removal, road development, and maintenance from wind energy development would be reduced compared to Alternative A as wind energy development would be prohibited on 11,531,340 acres within sage-grouse priority and general habitat (Map 2-31) and a total of 127 2-MW wind turbines are projected to be constructed. Surface disturbing activities would be reduced as wind energy developments would be sited five miles away from active leks. Industrial solar developments would be prohibited in ACECs and occupied sage-grouse habitats.

Overall livestock grazing management actions would be more restrictive and reduce total acreage for grazing, compared to Alternative A, by prohibiting grazing within sage-grouse priority habitat, which would eliminate impacts from grazing within these areas. Avoiding grazing and trailing within sage-grouse lekking, nesting, brood-rearing, and winter habitats during periods of the year when these habitats are utilized by sage-grouse would reduce herbivory and plant compaction in and help maintain sagebrush canopy cover in these areas.

Oil, gas, and/or geothermal activity could be reduced compared to Alternative A as it would be conducted to maximize avoidance of impacts to resources, which could reduce development activities and associated impacts to vegetation habitat. Fluid mineral developments would be reduced compared to Alternative A, by increasing closed areas to 16,878,220 acres and NSO areas to 2,117,160 acres. This could eliminate surface disturbing impacts from oil, gas, and/or geothermal activities within sage-grouse general and priority habitats. Vegetation habitat impacted by surface disturbing impacts would be reduced, as the number of wells would be reduced to 9,533 projected oil and gas wells and 1,594 CBNG wells and associated short-term and long-term surface disturbance acres would be reduced to 85,140 acres and 27,030 acres, respectively. Including COAs in permits when approving exploration of development for existing leases could reduce surface disturbing impacts from exploration and development in sage-grouse habitat areas, which would preserve vegetation habitat or reduce impacts to vegetation. Prohibiting construction of evaporation or infiltration reservoirs that hold produced water from CBNG activities would reduce surface disturbing activities in these areas and reduce associated negative impacts on vegetation resources.

The impacts on vegetation resources resulting from placing restrictions on surface disturbing activities within sage-grouse winter concentration areas would be the same as those identified in Alternative B. Under Alternative C, the restrictions on surface disturbing activities within winter concentration areas would apply year-round, but would only apply to federal leases and within sage-grouse priority habitat. These restrictions and management actions would reduce the total amount of area where surface disturbing activities could occur. Restrictions addressing sage-grouse priority and general habitats and would restrict the total permitted surface disturbing activities to less than 3%, which would reduce the total area where impacts could occur.

Impacts from vegetation management actions would be similar to Alternative A except in sage-grouse priority and general habitats; sagebrush canopy would not be reduced to less than 15% unless required by fuels management objectives. In addition, within sage-grouse priority and general habitat, vegetation treatments would create landscape patterns to benefit sage-grouse. These landscape patterns would increase overall vegetative community health by reducing monocot species stands. Fuels treatments in sage-grouse winter habitat would not be allowed unless they are designed to reduce wildfire risk and maintain habitat quality, which would help to maintain vegetation resources.

Impacts to vegetative resources from riparian management action would be reduced compared to Alternative A, as sage-grouse priority and general habitats would maintain six inches of stubble height on all riparian/meadow areas and herbaceous species, which could help maintain ecological functions. In addition, the wet meadow complexes would be maintained and managed to maintain a component of perennial forbs with diverse species richness, which would increase resistance to invasive species.

The impacts to vegetation from lands and realty actions would be similar to Alternative B, except they would be reduced as there would be no exceptions for disposal in sage-grouse priority habitat, which could help retain more land under the management of BLM/Forest Service and maintain larger contiguous vegetative communities.

Vegetation health could increase and the proliferation of invasive plant species could be reduced as fire management actions in sage-grouse priority and general habitats would implement fuels treatments with an emphasis on protecting existing sagebrush ecosystems. Fire would not be used to treat sagebrush within sage-grouse priority and general habitats in areas with less than 12 inches of annual precipitation which would prevent damage to sagebrush habitat and could reduce the potential for large fires. Noxious weeds could be reduced and ecological functions increased within sage-grouse priority and general habitats, as fuels management actions would ensure long-term persistence of seeded or pre-treatment native plants. Excluding livestock grazing (by fencing or closure) from burned areas until woody and herbaceous plants achieve sage-grouse habitat objectives would positively impact vegetation in areas affected by burns, as newly treated areas would have longer to recover before grazing disturbances resume. Mowing of grass could be used during fuelbreak fuels reductions, which would increase short-term surface disturbances, but would reduce fuel loads that feed large-intensity fires, remove vegetation, and increase potential for invasive species establishment. In priority and general habitats, fires would be suppressed to conserve habitat. Depending on individual field office's fire management plans, fewer acres would require full suppression under Alternative B than Alternative C, thus a greater number of acres may require ESR. ESR guidance would be the same for both priority and general habitats and would require livestock exclusion from the treated areas.

Impacts from recreation management would be same as Alternative B, except camping and other non-motorized recreation would be prohibited within four miles of active sage-grouse leks. This could reduce the level of recreation activities in the planning area and reduce vegetation habitat that is degraded from such activities.

Overall, travel management actions and related impacts on vegetation resources would be the same as Alternative B, except new road construction would be prohibited within four miles of active sage-grouse leks, new road construction would be avoided in priority and general habitat, and upgrading of existing routes would not be allowed, which would reduce the area impacted by surface disturbing activities compared to Alternative A. Route construction could be limited to realignments of existing designated routes and could eliminate the need to construct new roads and reduce the total area potentially impacted by travel management actions and associated surface disturbing activities.

4.16.6 Alternative D

ROW management actions and associated impacts to vegetation in sage-grouse core and connectivity habitats would be reduced compared to Alternative A, as new transmission projects could be allowed within existing designated utility corridors, the new proposed two mile wide corridor from July 1- March 14, or 0.5 miles of either side of existing 115 kV or larger transmission lines. Vegetation impacted would be reduced compared to Alternative A, as ROW exclusion areas would be increased to 5,230,110 acres.

Wind energy development would be avoided in sage-grouse core and connectivity habitat (4,608,420 acres), which would reduce the areas in which vegetation would be impacted compared to Alternative A. The impacts from surface disturbing activities would be from the construction of an estimated 980 turbines within the planning area, which is 22% fewer turbines compared to Alternative A.

Many riparian management impacts would be similar or the same as those in Alternative A, except the majority of differences would be found in sage-grouse core and connectivity habitat, as grazing would be balanced between riparian habitat and upland habitat to promote production and availability of beneficial forbs in meadows, mesic habitat, and riparian pastures for livestock, wildlife, and wild horses. This could increase plant production in riparian habitat and reduce impacts from grazing. Considering changes to season of use in riparian wetland areas before or after the hot growing could redistribute livestock, reduce the impacts from grazing on vegetation to other areas within the planning area.

Vegetation management would be similar to that in Alternative A, as vegetation treatment areas would not be rested from grazing and, as a result, impacts from grazing could increase compared to Alternative A. Impacts to grassland areas in sage-grouse core, connectivity, and general habitat could decrease compared to Alternative A, as grasslands would be prioritized commensurate with its threat to the region, which could allow for more resources to be used to protect and improve habitat within these areas.

Impacts from fluid mineral activities would be the same as Alternative A, except the level of intensity would be reduced because projected well development would be reduced to 13,083 oil and gas wells and 2,686 CBNG wells. The total overall impact by surface disturbing activities would be reduced in the short term to 122,910 acres and reduced in the long term to 37,720 acres. This represents a 6% decrease in short-term surface disturbance and a 3% decrease in long-term surface disturbance compared to Alternative A.

Non-energy management actions would be the same as in Alternative A, as exploration licenses and prospecting permits would be considered with appropriate mitigation and all non-energy leasable activities would be considered in sage-grouse core habitat if they can comply to surface occupancy and disturbance and density stipulations from the DDCT process. These management actions could potentially increase the extent of surface disturbing activities within sage-grouse core habitat which could increase impacts to vegetation resources.

Impacts to vegetation from locatable and salable mineral actions would be the same as those identified under Alternative A.

Impacts from surface occupancy or surface disturbing activities within and outside sage-grouse core and connectivity habitats would be restricted within 0.25 miles of occupied sage-grouse leks (Map 2-2). This would reduce surface disturbing activities compared to Alternative A, which could help preserve plant community health and continuity. Disruptive activities would be restricted within 0.25 miles of occupied sage-grouse leks from March 15 – May 15. This seasonal stipulation would increase the total amount of area restricted, compared to Alternative A, during the time of year when plant production is at its most important.

Impacts from surface disturbing energy production activities (excluding coal and trona mining and buried pipelines or power lines) would be similar but reduced compared to Alternative A, as energy production locations and/or transmission structures would not exceed an average of three per 640 acres and the combined value of existing and proposed disturbances would not exceed 9% loss of sagebrush habitat.

Impacts from travel management actions would be similar to Alternative A, except avoiding new road construction within 0.25 miles of occupied sage-grouse leks within sage-grouse core and connectivity habitat would reduce the total area affected by surface disturbing activities and reduce habitat fragmentation. Allowing for the natural deterioration of roads not designated in travel management plans would increase the positive impacts of travel management and decrease habitat fragmentation compared to Alternative A.

Impacts to vegetation from wildland fire and fuels management actions would be the same as those identified under Alternative A.

4.16.7 Proposed Land Use Plan Amendments

Impacts to vegetation (surface disturbance) from new transmission lines would be similar to those under Alternative D except they would be reduced as new transmission lines would only be allowed within a two-mile corridor, within 0.5 miles of an existing transmission line, or in areas where it can be demonstrated that declines in sage-grouse populations could be avoided through project design and/or mitigation; thus reducing the area where impacts could occur. ROW management actions and associated impacts to vegetation in PHMAs would be reduced compared to Alternative A, as ROW avoidance areas would be increased to 6,208,990 acres.

Wind energy development would be avoided in PHMAs (4,731,350 acres), which would reduce the areas in which vegetation would be impacted compared to Alternative A. The impacts from surface disturbing activities would be from the construction of an estimated 127 turbines within the planning area, which is 90% fewer turbines compared to Alternative A.

Impacts from fluid mineral activities would be similar to those described under Alternative A, except the level of intensity would be reduced because projected well development would be reduced to 12,355 oil and gas wells and 2,462 CBNG wells. The total overall impact by surface disturbing activities would be reduced in the short term to 112,330 acres and reduced in the long term to 35,340 acres. This represents a 6% decrease in short-term surface disturbance and a 3% decrease in long-term surface disturbance compared to Alternative A. Geophysical exploration projects that are designated to minimize habitat fragmentation within PHMAs, except where prohibited or restricted by existing LUP decisions, could reduce vegetation damage and the spread of invasive, non-native plant species.

Livestock grazing management and associated impacts on BLM-administered lands would be the same as Alternative A, except in the case of the development of grazing strategies which would be similar to Alternative D. Overall management actions for drought conditions are very similar to Alternative D, except management actions would not be limited to season of use or stocking rate changes and drought contingency

plans would be developed. This could allow greater ability to reduce impacts from livestock grazing. On National Forest System lands, grazing guidelines would be implemented that limit the amount of allowable use on perennial grass, shrubs, upland herbaceous species, and herbaceous riparian/wet meadow vegetation. These guidelines would reduce grazing impacts to vegetation compared with Alternative A.

Authorized supplemental feeding, where appropriate, could reduce direct vegetation removal through herbivory, but could cause higher concentrations of cattle in these areas and lead to increased vegetation and soil compaction. Impacts from surface disturbing activities associated with livestock trailing would be reduced compared to Alternative A, as authorized trailing plans would be designed to avoid sensitive areas and/or time periods.

Riparian management actions and associated impacts would be the similar as those identified in Alternative A, except they would incorporate management to vary grazing between riparian habitat and upland habitat. This could reduce overall impacts to riparian habitat from livestock grazing and maintain or improve vegetative community health. Water development impacts to vegetation could be reduced compared to Alternative A, as more stipulations could restrict new developments across the entire planning area. Positive impacts from range improvements could be increased as new improvements would focus on achieving rangeland health standards that maintain and/or improve sage-grouse habitat.

Vegetation management actions and impacts would be similar to those found under Alternative A, except vegetation would be managed to achieve not only sage-grouse objectives but also other resource objectives, which could reduce negative impacts to vegetation. Treatments and fire management actions on vegetation would be similar to Alternatives C and D, except the threshold for surface disturbances would be 5%. Fuel treatments would also be based on WGFD protocols for treating sagebrush to benefit sage-grouse, which could positively impact vegetation resources compared to the other alternatives.

Impacts to vegetation associated with solid mineral leasing would be similar to Alternative A, except impacts would be reduced as mitigation and protective measures would be applied to sage-grouse habitat, which would reduce total area where surface disturbing activities could occur. Coal exploration management actions and associated impacts to vegetation would be similar to Alternative A, but could be reduced due to the need to comply with surface occupancy, disturbance, and density stipulations analyzed through the DDCT process.

Impacts on vegetation resources from locatable mineral development would be similar to those identified under Alternative A, except 1,146,130 acres would be proposed for withdrawal or considered for proposed withdrawal (Map 2-23), which would eliminate all impacts from locatable mineral development within these areas.

Impacts from salable mineral actions would be similar to Alternative A, except all salable mineral activities within PHMAs must be in compliance within surface occupancy, seasonal restrictions, and disturbance and density stipulations analyzed through the DDCT process. Impacts from closure and restoration of salable mineral pits no longer in use to meet sage-grouse habitat conservation objectives would increase over those in Alternative A as more area would be reclaimed and vegetation would be restored.

Travel management actions and associated impacts on vegetation would be similar to those described under Alternative A, except new primary and secondary roads would avoid areas within 1.9 miles of the perimeter of occupied sage-grouse leks and other new roads would be prohibited within 0.6 miles of sage-grouse leks within PHMAs. This would reduce the amount of surface disturbing activities from new roads in these areas but could increase new road distances if they are constructed to go around these areas. Vegetation would be restored in more areas compared to Alternative A, as the number of unauthorized or redundant and unnecessary roads that would be reclaimed could be increased. Impacts from surface disturbances would

be reduced compared to Alternative A, as the disturbance threshold would be set at 5%. Road and trail reclamation actions and impacts would be similar to those described in Alternative A, except natural reclamation would be managed on all roads that are not designated in travel management plans within PHMAs, which would increase vegetative cover in these areas.

Fuels management actions under this alternative would consider multiple tools for fuels reduction. These management actions could increase impacts to vegetation by allowing more surface disturbing activities, but could also reduce impacts from fires. Impacts in the Proposed LUP Amendments would be similar to Alternative B, with greater protection measures in place to protect PHMAs from wildfires with the placement of green strips and/or fuel breaks and the development of wildfire prevention plans.

Restrictions and management actions would reduce the total amount of area where surface disturbing activities could occur. Overall surface disturbance would be limited to no more than 5% of PHMAs (core only) using the DDCT process. Surface occupancy and surface disturbing activities would be prohibited within 0.6 miles of occupied sage-grouse leks in PHMAs and within 0.25 miles of occupied leks in GHMAs (Map 2-3), which would increase the amount of area protected throughout the planning area and reduce surface disturbing activities and related impacts, compared to Alternative A.

4.17 VISUAL RESOURCES

This section presents potential impacts on visual resources from implementing management actions presented in Chapter 2. Existing conditions concerning visual resources are described in Chapter 3.

The purposes of VRM within the BLM and the Scenery Management System (SMS) SIOs and/or VQO within the Forest Service are to manage the quality of the visual environment and to minimize the visual impact of development activities, while maintaining the viability of all resource programs. Much of the planning area contains natural settings with limited development, open spaces with panoramic vistas, and scenic views.

During a BLM RMP revision, impacts to visual resources would be compared against a Visual Resource Inventory (VRI) as the baseline, while VRM classes are being considered. In these LUP amendments, since new VRM classes are not being considered, impacts to visual resources will be compared against the existing VRM decisions that have been made in the six RMPs.

4.17.1 Impact Indicators

Indicators of impacts on visual resources are as follows:

- The amount of surface disturbance and vegetation removal
- The amount of human structures visible on the landscape
- The amount of movement visible on the landscape
- The amount of light pollution in the night skies.

4.17.2 Assumptions

The analysis is based on the following assumptions:

- All alternatives would conform with visual resource decisions in existing land use plans. Contrast rating analysis completed during project implementation and future activity plans would consider Greater Sage-Grouse management actions in this plan.
- VRM/SIO/VQO objectives would be achieved.
- VRM/SIO/VQO objectives provide for varying degrees of change (impact) to the visual quality of the landscape.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.17.3 Alternative A

The combined impacts to visual resource from Alternative A would be the greatest of all the alternatives. Surface disturbing activities such as oil and gas leasing, mining activities including coal and trona, other solid mineral leasing, mineral materials exploration and sales, wind energy development, utility facility development, and transmission line development would reduce the quality of visual resources throughout much of the planning area. The removal of vegetation and soil changes the color, form, and texture of the landscape. Buildings and structures change the color and form of the landscape. Linear scars such as

transmission lines, roads, and buried pipelines change the line of the landscape. All of these activities create noticeable patterns that impact the natural visual values in the planning area. Actions such as mineral closures and surface disturbance restrictions designed to protect Greater Sage-Grouse (discussed in more detail below) would prevent some of the impacts listed above. Some Greater Sage-Grouse impact deterrents (e.g., fence markers and power line basketballs) would increase the visibility of fences, power lines, towers, and other man-made structures, which would increase the contrast created by such visual impacts. However, most actions that protect sage-grouse also protect visual resources.

Oil and gas leasing would be allowed within core and general sage-grouse habitat (Map 2-4) with 13,653 oil and gas wells and 2,758 CBNG wells projected during the planning period. This would cause an estimated 130,330 acres of short-term surface disturbance and 39,050 acres of long-term disturbance. Impacts to visual resources from oil and gas exploration include the short-term placement of tall drilling rigs, which break the skyline and create massive intrusions to otherwise natural visual settings. Over the long term, roads and ROWs needed for drilling operations are the most visible, breaking the line and form of natural settings. Long-term oil and gas facilities are often nestled into hillsides or painted to blend with the natural visual environment. There is still an impact where such facilities are seen, but mitigation techniques and restoration efforts minimize the overall effect. Oil and gas leasing would be compatible with VRM class IV, SIO Low, and VQO Modification and could be compatible with VRM Class II and III, SIO Moderate, and VQO Partial Retention depending on design features.

The development of coal resources and locatable, salable, and non-energy leasable minerals all have similar impacts upon visual resources as oil and gas leasing. Surface coal mines and mineral borrow pits remove the top-most layer of vegetation and soil across wide areas. These denuded areas impact scenery due to changes in form, color, and texture. Such changes would only be compatible in VRM class IV, SIO Low, and VQO Modification areas.

Efforts to protect sage-grouse and sagebrush habitat through prohibiting surface-disturbance on 68,550 acres of the planning area and avoiding surface-disturbance on 93,580 acres would reduce the overall level of surface disturbance resulting from new permitted activities, which would preserve and protect visual resources from the impacts listed in the previous three paragraphs. Site-specific conservation and mitigation objectives, such as BMPs could help reduce visual impacts that occur. Measures such as topographic screening, color matching and camouflaging, and measures that reduce the footprint on-the-ground would reduce contrast with natural scenic elements of the landscape. In addition, reclamation of surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) could effectively remove the most of the visual contrast created by surface disturbance. Replacing denuded areas with native vegetation and other reclamation practices would eventually restore native colors, shapes, lines, and forms to match surrounding natural scenery. The restoration of unused roads or redundant routes in some BLM/Forest Service areas would remove linear visual features from the landscape over the long term.

Exceptions to lease stipulations, COAs, and T&Cs considered on a case-by-case basis would temporarily increase the ability to develop oil and gas leases, which would result in short-term, increased development throughout the planning area. This would increase visual impacts described above, associated with surface-disturbing activities.

Vegetation treatments such as Integrated Vegetation Management to control noxious weeds, prescribed burns, and other fuels reduction practices would impact visual resources by removing vegetation, which changes the color and texture of the visual environment. Prescribed burns create a very noticeable, short-term change in color from naturally green vegetation from sagebrush and grasses to black burn scars over large areas. As sagebrush can take decades to reestablish fully, long-term changes to landscape color and texture may be visible for the duration of the planning period. Vegetation treatments would be compatible

with VRM class IV, SIO Low, and VQO Modification and possibly class III, SIO Moderate, and VQO Partial Retention if a natural-looking mosaic pattern can be created. Only minor vegetation changes would be compatible with VRM class II, SIO High and VQO Retention.

ROW exclusion (285,930 acres) and avoidance areas (2,460,340 acres) (Map 2-9) within core habitat and limiting ROWs and transmission projects to designated corridors in some areas would serve to consolidate utility ROWs and structures. This would reduce the extent of disturbed areas and eliminate many visual impacts. Linear impacts from ROWs and power lines would be eliminated in many areas, which would improve visual quality across the planning area. Designating specific corridors along existing roads or in areas that are already disturbed would help reduce visual impacts in areas where visual quality may be more sensitive.

Allowing wind energy development in sage-grouse core, connectivity, and general habitat areas, except in areas that are currently unavailable for such development (Map 2-29), would increase the number of man-made structures that disrupt horizons and break up natural landscape views. Wind energy development entails tall, vertical structures, painted reflective white, with moving blades that can be seen for many miles, a visual impact that would be incompatible with all VRM classes except class IV. Through the year 2020, 1,254 wind turbines are projected in the planning area. Because current Federal Aviation Administration guidelines do not allow color screening, wind turbines must be white for visibility and aviation safety. The towers affect the line, color, and texture of views across the landscape, most often breaking the horizon line. The moving, spinning nature of the towers also attracts attention. Any towers placed in VRM classes I through III would be incompatible with objectives for that class. Across the planning area, 424,820 acres would be closed to wind development and 2,438,850 acres would have restrictions on wind development. This would limit or eliminate visual impacts in these areas.

Avoiding new MET towers within 1 mile of occupied habitat could reduce the appearance of tall visual obstructions in some areas, although the total number of towers in the planning area may not change.

Land disposals identified within core habitat could remove land from public ownership, which would remove VRM, SIO, and VQO designations and the visual resource protections accompanying them. This could result in new landowners making changes to the visual environment. Conversely, the pursuit of land acquisitions in the Bolton Creek Drainage and Bates Creek could add lands to federal ownership. Depending on VRM categories assigned to these areas, visual resources could receive protection against changes to the landscape and natural settings.

Range improvements and wild horse water developments would add ponds, fences, and other structures that would be visible from great distances on otherwise natural rangeland visual environments. Fences add linear features to the visual setting and ponds change the shape, texture, and color. The visual contrast from range improvements would likely be compatible with VRM classes III and IV, SIO Moderate and Low, and VQO Partial Retention and Modification.

“Open” OHV areas (i.e., Poison Spider OHV Park, Dune Pond Cooperative Management Area, and Greater Sand Dunes Recreation Area) could create new trails and tracks on the ground that would deteriorate visual resources through changes in color and line that would contrast with the natural scenery. On sandy or rocky terrain, an “open” OHV designation would not create as much visual contrast across the landscape. On vegetated areas, however, such as grass or small shrubs, line and texture changes across the landscape would become noticeable enough to conflict with VRM class II objectives. Moving vehicles and associated dust clouds on dirt roads and dusty areas would also temporarily decrease visual quality through changes to landscape texture and an increase in regional haze. “Open” OHV areas would be most compatible with VRM classes III and IV.

4.17.4 Alternative B

Impacts to visual resource from Alternative B would be the least of all the alternatives except Alternative C. Surface disturbing activities such as oil and gas leasing, mining activities including coal and trona, other solid mineral leasing, mineral materials exploration and sales, wind energy development, utility facility development, and transmission line development would have a similar impact as Alternative A, but across less total area. Approximately 6,886,890 acres would be closed to oil and gas leasing under Alternative B (Map 2-5), which would reduce the short-term surface disturbance by 20% from Alternative A to 104,050 acres and reduce the long-term disturbance by 14% to 33,530 acres. These closures, as well as NSO restrictions, would nearly eliminate visual impacts within sage-grouse priority habitat areas. Overall, 11,555 oil and gas wells (15% fewer than Alternative A) and 2,154 CBNG wells (22% fewer than Alternative A) are projected over the life of the plan under Alternative B. Unitization requirements on priority habitat would further reduce visual impacts by grouping impacts from multiple wells onto a single site, which would limit the distribution of visual impacts.

Finding coal leasing unsuitable; closing non-energy leasable minerals, withdrawing locatable mineral from entry, and closing mineral material exploration, sales, and free use permits in priority habitat areas would eliminate visual impacts in those areas. Impacts from the development of these minerals in other areas would have the same impact on visual resources as described under Alternative A. Restoring salable mineral pits that are no longer in use could reduce the visual contrast created by pits. In the long term, native vegetation could blend the areas back into the surrounding visual landscape. Managing sage-grouse priority areas as exclusion areas and limiting all surface disturbance in priority sage-grouse habitat to 3% of the total area would reduce the overall level of surface disturbance, which would preserve and protect visual resources from impacts from all sources as described under Alternative A within these areas.

Site-specific conservation and mitigation objectives, lease stipulations, consolidation of infrastructure on existing leases, RDFs, and BMPs would continue to reduce visual impacts that occur, the same as under Alternative A. Reclamation of surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same effect on visual resources as Alternative A. Extending the restoration of roads to all undesignated routes would extend the effects described under Alternative A to more areas.

Disallowing exceptions to lease stipulations, COAs, and T&Cs within priority habitat areas would decrease the ability to develop oil and gas leases in these areas. This would decrease impacts to visual resources from oil and gas development described above. Outside priority habitat areas, impacts would be the same as under Alternative A.

Limiting vegetation treatments to 15% cover reduction and reducing fuel treatments in sage-grouse winter range would reduce the impacts described under Alternative A. Reducing the overall footprint of vegetation treatments would be more compatible with VRM class III, SIO Moderate, and VQO Partial Retention than under Alternative A.

Expanding ROW exclusion to include all priority sage-grouse habitat, expanding avoidance to all general habitat, and limiting ROWs and transmission projects to designated corridors throughout the planning area would eliminate impacts to visual resources described under Alternative A within priority habitat areas and reduce visual impacts within general habitat areas.

Wind energy development would be eliminated within priority habitat and limited within general habitat (Map 2-30). The removal and reduction of potential wind energy development would have a significant effect compared to Alternative A. The increase in areas unavailable for wind energy development (5,033,240 acres compared to 424,820 acres under Alternative A) would reduce the number of projected

wind turbines especially in areas of high potential for wind development. Based on these restrictions, 127 wind turbines could be developed across the planning area through 2020. Compared to Alternative A, 1,127 fewer wind turbines (or 90% fewer) would be a significant decrease. Impacts to visual resources from wind energy development would be mostly eliminated compared to Alternative A.

Removing or burying power lines within sage-grouse priority habitat could remove linear visual impacts from the landscape. However, trenching required to bury power lines could create more visual contrast than leaving them above ground. This impact could be mitigated depending on the method used to bury the lines. Trenchless methods would remove almost all visible landscape scars.

Prohibiting MET towers within priority habitat would eliminate the impacts described under Alternative A. Outside these areas, impacts would be the same as Alternative A.

Retaining public ownership of lands, with a few exceptions, within priority habitat would eliminate the impacts described under Alternative A. Outside these areas, impacts would be the same as Alternative A. Identifying land acquisitions that benefit sage-grouse habitat would expand the effects of increased VRM management described under Alternative A to any additional areas acquired.

Range improvements and wild horse water developments would have similar impacts to visual resources as under Alternative A.

Eliminating OHV "open" areas except the sand portions of those areas and only allowing travel on designated routes would minimize impacts described under Alternative A. The sandy areas do not impact visual resources the same as vegetated areas, because it is the loss of vegetation that creates changes to line and color associated with vehicle travel. Impacts still occur on the designated routes, but are eliminated everywhere else.

4.17.5 Alternative C

Impacts to visual resource from Alternative C would be the least of all the alternatives. Surface disturbing activities would have a similar impact as described in Alternative A, but across less total area. Alternative C would have the least surface disturbance of all the alternatives, creating the fewest such visual impacts. Oil and gas leasing would not be open on any areas within priority and general sage-grouse habitat under Alternative C (Map 2-6). This would remove impacts discussed under Alternative A for all except valid existing leases. This would reduce the short-term surface disturbance by 35% from Alternative A to 85,140 acres and reduce the long-term disturbance by 31% to 27,030 acres. NSO restrictions on existing leases in priority habitat (same as Alternative B) would nearly eliminate related visual impacts within these areas. Overall, 9,533 oil and gas wells (30% fewer than Alternative A) and 1,594 CBNG wells (42% fewer than Alternative A) are projected over the life of the plan under Alternative C. Unitization requirements would have the same effect as under Alternative B.

Impacts from coal leasing; non-energy leasable minerals, locatable mineral entry, and mineral material exploration, sales, and free use permits would be the same as under Alternative B. Restoring salable mineral pits that are no longer in use would have the same effect as Alternative B. Managing both priority and general habitat areas as exclusion areas would reduce the impacts described under Alternative A within these areas.

Site-specific conservation and mitigation objectives, lease stipulations, consolidation of infrastructure on existing leases, RDFs, and BMPs would continue to reduce visual impacts that occur, the same as under Alternative A. Reclamation of surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same effect on visual resources as

Alternative A. Extending the restoration of roads to all undesignated routes would have the same effects as described under Alternative B. Prohibiting new road construction within 4 miles of active leks and avoiding new roads in priority and general habitat would reduce the creation of new linear visual contrasts throughout the planning area and eliminate them within 4 miles of active leks.

Disallowing exceptions to lease stipulations, COAs, and T&Cs within priority habitat areas (same as Alternative B) and general habitat areas (expanded from Alternative B) would decrease the ability to develop oil and gas leases in these areas. This would decrease impacts to visual resources from oil and gas development described above. Outside priority and general habitat areas, impacts would be the same as under Alternative A.

Expanding the 15% cover reduction limitation under Alternative B to include both priority and general habitat areas would reduce the impacts described under Alternative A, more so than under Alternative B.

Expanding ROW exclusion to include all priority and general sage-grouse habitat (11,531,340 acres, expanded from Alternative B) (Map 2-11) and limiting ROWs and transmission projects to designated corridors (same as Alternative B) would eliminate impacts to visual resources from ROWs within priority and general habitat areas except in designated corridors.

Wind energy development would also be eliminated within priority habitat and general habitat (expanded from Alternative B with 11,531,340 acres closed compared to 424,820 acres under Alternative A) (Map 2-31). Based on these restrictions, 127 wind turbines could be developed across the planning area through 2020, the same significant impact as under Alternative B, except areas in which wind turbines could be built would be even more limited. The removal and reduction of potential wind energy would be a significant change over Alternative A. Prohibiting industrial solar projects in ACECs and occupied habitat would eliminate potential impacts from solar developments in these areas. Impacts from facilities and mirrors required for solar developments include large structures and vast areas where mirrors reflect the sun. Such structures change the color, reflectivity, form, and texture of the visual environment. Denying such development in these areas; however, would likely only move the impacts to other areas. Removing or burying power lines within sage-grouse priority habitat would be the same as under Alternative B.

The impact from MET towers would be the same as described under Alternative A.

Retaining public ownership of lands within priority habitat without exceptions mentioned under Alternative B would have similar effects described under Alternative B, only in more areas. Impacts from identifying land acquisitions would be the same as under Alternative B.

Avoiding structural range improvements could reduce visual impacts described under Alternative A. This alternative could prevent such improvements as cattle guards, fences, and corrals, which would eliminate impacts that would create lines or add form to visual characteristics. Wild horse water developments would have similar impacts to visual resources as under Alternative A.

Impacts from OHV use, particularly in areas designated as “open” under Alternative A would be the same as described under Alternative B.

4.17.6 Alternative D

Impacts to visual resource from Alternative D would be the greatest of all the alternatives except Alternative A. Surface disturbing activities would have a similar impact as described in Alternative A, but across less total area. Areas closed to oil and gas leasing would be expanded to include Raven Creek in the Newcastle Field Office and three areas in the Pinedale Field Office. This would reduce impacts from

minerals management on visual resources from Alternative A, but not by nearly as much as Alternatives B and C. Estimated short-term surface disturbance would be reduced by 6% from Alternative A to 122,910 acres and long-term disturbance would be reduced by about 3% to 37,720 acres. In addition, density limitations of three locations per 640 acres and a 9% disturbance cap within core habitat would limit how much surface disturbance would occur. The NSO restrictions will not be used, which could increase surface disturbance and thus visual impacts. Overall, 13,083 oil and gas wells (4% fewer than Alternative A) and 2,686 CBNG wells (3% fewer than Alternative A) are projected over the life of the plan under Alternative D. Unitization requirements would have the same effect as under Alternative B.

Impacts from coal leasing would be of the same type as described under Alternative A, but on less area. Coal leasing would occur on more area than Alternatives B and C, thus the impacts on visual resources would be greater than those alternatives. Non-energy leasable minerals would be allowed on much the same area as Alternative A, but with more mitigation aimed at protecting sagebrush habitat, which would reduce impacts to visual resources as well. Locatable mineral entry, mineral material exploration, sales, and free use permits would be the same as under Alternative A. With all of these activities, density limitations of three locations per 640 acres and a 9% disturbance cap within core habitat would apply in sage-grouse core areas. This would limit visual impacts in those areas and reduce potential sources of visual contrast in line, form, shape, color, and texture.

Site-specific conservation and mitigation objectives, lease stipulations, consolidation of infrastructure on existing leases, RDFs, and BMPs would continue to reduce visual impacts that occur, the same as under Alternative A. Reclamation of surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same effect on visual resources as Alternative A. Allowing undesignated routes to reclaim naturally would have the same effects as described under Alternative C, although it may take longer than manually reclaiming the routes before the visual contrast begins to diminish and the routes blend in with their surroundings. Avoiding occupied leks with a 0.25-mile buffer would have little effect towards reducing visual impacts and could create greater visibility for new roads. Avoiding leks could cause roads to be built in more prominent locations, with great visual impact from greater distance.

Exceptions to lease stipulations, COAs, and T&Cs would have the same impacts as under Alternative A.

Impacts from vegetation and fuels management would be the same as described under Alternative A, except that some types of fuels treatment, such as prescribed burns could be limited in core and connectivity sage-grouse habitat. Reduction of prescribed burns and the use of other means of fuels treatments in these areas would reduce short-term impacts to the visual environment from fire. Changes in color and texture would be less noticeable, and thus more acceptable even possibly within VRM class II, SIO High, and VQO Retention.

Managing sage-grouse core and connectivity habitat areas as ROW exclusion areas (5,230,110 acres) (Map 2-12) would reduce the impacts described under Alternative A. Inside sage-grouse core and connectivity areas, impacts to visual resources would be the same as Alternatives B and C, but in general habitat areas, impacts would be similar to Alternative A. The management of ROW corridors would be the same as Alternative A.

Limiting the construction of wind turbines in sage-grouse core and connectivity habitat unless it can be shown that sage-grouse populations would not decline would reduce the total number of wind turbines in the planning area (Map 2-32). Excluding wind energy development on 424,820 acres and avoiding wind energy development on 4,608,420 acres would reduce the number of projected wind turbines especially in areas of high potential for wind development. Based on these restrictions, 980 wind turbines could be

developed across the planning area through 2020. Compared to Alternative A, this is 274 or 22% fewer wind turbines.

The impact from MET towers would be the same as described under Alternative A.

Retaining public ownership of lands within priority habitat would be the same as under Alternative B. The effects from identifying land acquisitions would be the same as under Alternative A.

Impacts from range improvements and wild horse developments would be the same as under Alternative A.

Impacts from OHV use would be the same as Alternative A.

4.17.7 Proposed Land Use Plan Amendments

Impacts to visual resource from the Proposed LUP Amendments would be the greater than Alternatives B and C, but less than Alternatives A and D. Surface disturbing activities would have a similar impact as described in Alternative A, but across less total area. Restrictions on oil and gas leasing (e.g., NSO and CSU stipulations) would be greatly increased compared to Alternative A, which would further protect visual resources. Estimated short-term surface disturbance resulting from well development would be reduced by 14% to 112,330 acres, and long-term disturbance would be reduced by 9% to 35,430 acres. In addition, density limitations of one oil and gas or mining location per 640 acres in PHMAs (core only) with no more than 5% disturbance maximum will limit how much surface disturbance will occur. This would reduce visual impacts more than Alternative A within PHMAs. NSO restrictions would be increased from Alternative A, which would reduce many of the surface disturbing impacts that reduce the quality of the visual environment. Overall, 12,355 oil and gas wells (10% fewer than Alternative A) and 2,462 CBNG wells (11% fewer than Alternative A) are projected over the life of the plan under the Proposed LUP Amendments. Unitization requirements would have the same effect as under Alternative B.

Impacts from coal leasing and non-energy leasable minerals would be the same as Alternative D. Management actions that consider withdrawals for locatable mineral entry and requiring stipulations for mineral material exploration, sales, and free use permits would reduce visual impacts compared to and as described under Alternative A. In PHMAs (core only), density limitations of one oil and gas or mining location per 640 acres, and a 5% disturbance cap would limit the visual impacts for all of these resources as well. The impacts from restoring salable mineral pits that are no longer in use would be the same as under Alternative B.

Site-specific conservation and mitigation objectives, lease stipulations, consolidation of infrastructure on existing leases, RDFs, and BMPs would continue to reduce visual impacts that occur, the same as under Alternative A. Reclamation of surface disturbances in sage-grouse habitats in accordance with the Wyoming Reclamation Policy (BLM 2009a) would have the same effect on visual resources as Alternative A. Allowing undesignated routes to reclaim naturally would have the same effects as described under Alternative A, except effects would be extended to wilderness study and characteristics areas. Reclaiming unauthorized roads and two-track routes would further reduce the visual impacts described above from roads over the long term. Avoiding new primary and secondary road construction within 1.9 miles of occupied leks within PHMAs would reduce visual impacts more than under Alternative A, which proposes a 0.25-mile buffer, due to visual distance of roads being harder to see at greater distance. However, rerouting of roads around occupied leks could still create greater visibility for new roads. Avoiding leks could cause roads to be built in more prominent locations, with great visual impact from greater distance.

Exceptions to lease stipulations, COAs, and T&Cs would have the same impacts as under Alternative A.

Impacts from vegetation and fuels management would be the same as Alternative B.

The management of ROW exclusion areas (285,930 acres) and avoidance areas (6,208,990 acres) (Map 2-13) within PHMAs and GHMAs would be similar to the impacts described under Alternative A, except the acres of avoidance areas would increase, which could decrease visual impacts from ROWs. The management of ROW corridors would be the same as Alternative A. Removing or reclaiming developments from existing authorizations, ROWs, or SUAs that are expired or no longer in use could remove existing visual impacts through removing structures that contrast with the natural landscape.

The development of wind energy would result in impacts similar to those identified under Alternative A, except avoidance areas would be increased to 4,731,350 acres (Map 2-33). As a result, 127 wind turbines would be developed across the planning area through 2020. Compared to Alternative A, 1,127 fewer wind turbines would be constructed, which is a 90% reduction.

Avoiding placing MET towers within two miles of active sage-grouse leks within PHMAs would have a similar impact as Alternative A, except right around leks. The total number of towers across the planning area would likely remain the same.

Retaining public ownership of lands within PHMAs would be the same as under Alternative B. The effects from identifying land acquisitions would be the same as under Alternative A.

Impacts from range improvements and wild horse water developments would be the same as under Alternative A.

Impacts from OHV use would be the same as Alternative A, except on non-sand dune portions of “open” areas within PHMAs, which would become limited to existing roads and trails. Such areas could see fewer visual impacts from prohibiting motorized travel off of areas that aren’t already previously disturbed.

4.18 WATERSHED AND WATER QUALITY

This section presents potential impacts on watershed resources and water quality from implementing management actions presented in Chapter 2. Existing conditions concerning watershed resources and water quality are described in Chapter 3.

4.18.1 Impact Indicators

Indicators of impacts on water resources are as follows:

- Amount of land subject to surface disturbance
- Vegetation cover (measured by acres in which vegetation would be removed/degraded or protected/maintained)
- Water quality.

4.18.2 Assumptions

The analysis was based on the following assumptions:

- The State of Wyoming has primacy with regard to water quality and quantity. The BLM and the Forest Service manage the public lands within the analysis area. The management of these lands can affect the quality and timing of flows of the waters through them. Because the state must comply with federal laws, compliance with state laws includes compliance with federal rules and regulations, including the Clean Water Act, Colorado River Salinity Compact, Safe Drinking Water Act, and others. Therefore, it is assumed that any discharged water would meet water quality standards at the point of discharge.
- Water flows down gradient. Larger volumes of material of greater sizes can be carried the faster water flows.
- Management actions that mitigate adverse impacts to soil and vegetation resources will help minimize management-related soil erosion and sediment, salt, and excess nutrient loading to water bodies.
- Degradation of stream channel and land health conditions can be quite rapid, for example, during a single, large flood event. Recovery is often a much slower process. It is generally more efficient to prevent degradation in the first place rather than to recover a degraded system.
- Any activities that affect the ecological condition of the watershed and its vegetative cover would directly or indirectly affect the aquatic environment. The degree of impact attributed to any one disturbance or series of disturbances is influenced by location within the watershed, time and degree of disturbance, existing vegetation, and hydrologic condition.
- As mineral development continues to expand, there will be an increase in produced water volumes that will decrease as the rate of development decreases and the groundwater is drained.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.18.3 Alternative A

Surface disturbing activities can result in removal of vegetative cover, soil compaction, and increased erosion rates due to the exposure of soil particles to wind and water. There is a close correlation between the condition of soil and vegetation and water quality. Removal of vegetation generally increases the rate at which water flows off the land. Substantial disturbance to soil, including compaction of soil or changes in vegetative cover that result in decreased surface coverage, root depth, or root density, would increase water runoff. Soil disturbance would also alter timing and duration of runoff, reduce infiltration capacity, and accelerate erosion, sedimentation, and the addition of nutrients and sediment loads to stream channels, thereby degrading water quality, channel structure, and overall watershed health. As the amount of surface disturbance increases, the ability of a watershed to buffer high flows, filter water and sediment, and provide habitat, such as stream cover, decreases. The degree of impact attributed to any one disturbance or series of disturbances is influenced by several factors, including location within the watershed, time and degree of disturbance, existing vegetation, and precipitation.

Surface disturbance restrictions apply to activities related to fluid mineral leasing/oil and gas activities on new leases (including development of associated infrastructure), development associated with linear and non-linear ROWs (some of which are related to oil and gas, wind energy, and solar energy development and some of which are not), construction of MET towers, development of other leasable minerals and mineral materials, livestock grazing management and range improvements, wildfire, fuels and large vegetation treatments, and disruptive activities that require a Special Use Permit.

A reduction in surface occupancy and disturbances would decrease vegetation removal, soil compaction, overland flow, and sediment, salt, and excess nutrient transport to water bodies, and better maintain the health and function of watershed resources and water quality in both the short term and long term.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within sage-grouse core habitats would maintain the health and function of watershed resources and water quality in the short-term as no new roads would be constructed, and no off road travel would be allowed. Roads affect the movement of water, changing the drainage system by acting both as dams and as a superimposed set of ephemeral channels, redirecting water from natural drainage patterns.

Limiting ROWs and transmission projects to designated corridors in some areas would result in increased short-term soil erosion and sediment loading to nearby streams and rivers until the disturbed area was successfully reclaimed. Increased channelization of surface runoff would occur in ruts, road ditches, and areas of compacted soil. However, these restrictions would concentrate the locations of surface disturbance within designated ROWs in the long-term, which would limit widespread soil erosion and runoff throughout the planning area.

Managing portions of sage-grouse core habitat areas as ROW exclusion areas (285,930 acres) would result in no associated surface disturbing activities in these areas, and managing portions of sage-grouse general habitat areas as ROW avoidance areas (2,460,340 acres) would result in a low likelihood of associated surface disturbance occurring within these areas (Map 2-9). Vegetation removal, soil erosion, overland flow, and sediment, salt, and excess nutrient transport to water bodies within these habitats would be reduced. However, these projects may be shifted outside of habitat areas, which would shift water impacts and could create instances of increased erosion and runoff to water bodies if these projects occur in areas with sensitive or less stable soils.

Wind energy development activities involve land-clearing and surface disturbances. Allowing wind energy development in sage-grouse core habitat areas, except in areas that would be closed to development, would

remove and disturb vegetation and result in short-term soil erosion and overland flow, until these areas were stabilized and vegetated. Wind energy development would potentially occur in all sage-grouse core habitat areas, except for 424,820 acres that would be closed (Map 2-29). Approximately 1,254 2-MW wind turbines are projected to be constructed across the entire planning area. Within the closed areas, no land-clearing and surface disturbance associated with the development of new wind turbines or their access roads would occur, which would in turn reduce the amount of overall soil disturbance and vegetation removal associated with this activity. This would decrease the amount of soil erosion, runoff, and excess nutrient loading to water bodies that would occur as a result of wind energy development.

Authorizing the construction of MET towers in certain areas, and on a case-by-case basis, could result in short-term surface disturbance, soil erosion, compaction, and increased overland flow, if authorized. If not authorized, these water impacts associated with the construction MET towers would not occur.

Livestock grazing and range improvements involve localized surface disturbance, including vegetation removal and soil compaction, from activities such as concentrated grazing, water development and salt block and mineral supplement placement, and construction of fences. These activities near wildlife habitat and riparian areas would all lead to short-term soil compaction, erosion, and excess sediment runoff directly into riparian and water habitats, and potential long-term surface disturbance in areas where livestock congregate, particularly around salt blocks, which could lead to constant soil compaction and erosion in these areas.

Enforcement of proper grazing management practices, including managing lotic and lentic wetland/riparian areas toward PFC and utilization of BLM and Forest Service guidance to evaluate land health standards (i.e., monitoring) are needed. Maintenance of functioning uplands and riparian areas would enhance and maintain riparian and wetland vegetation communities, stream channels, soils, water balance, and water quality in the long-term. Livestock water development projects could result in surface disturbance, but could also alleviate pressure from grazing in riparian areas, which would reduce the amount of erosion and compaction caused by grazing, thereby decreasing the amount of water runoff and excess sediment and nutrient loading into nearby water bodies.

Allowing fluid mineral development within sage-grouse core habitat areas throughout the planning area (except in areas that are closed [871,780 acres] and where restricted by NSO [40,980 acres] and CSU [5,015,210 acres]) stipulations (Map 2-4) would increase vegetation removal, soil erosion, and runoff. Under this Alternative, 13,653 BLM or Forest Service oil and gas wells and 2,758 CBNG wells would be anticipated in sage-grouse core habitat areas, resulting in 130,330 acres that would be disturbed over the short-term (before reclamation), and 39,050 acres that would be disturbed over the long-term (after reclamation). Fluid mineral leasing activities would involve land-clearing and surface disturbances, such as the construction of well pads, roads, and pipelines in sage-grouse core habitat areas. These actions remove and disturb vegetation, expose soils to the erosive forces of water and wind, and can alter and accelerate overland flow, resulting in increased transport of sediment, salt, and excess nutrients to water bodies both in the short-term, during construction activities, and long-term, as permanent structures, such as well pads, pits, and roads are maintained. Groundwater in these areas could also be affected by oil and gas leasing activities through withdrawal, injection, or mixing of material from different geologic layers or the surface. Withdrawal of groundwater could affect local groundwater flow patterns and create changes in quality and quantity of the remaining groundwater.

Continuation of exceptions to lease stipulations, COAs, and terms and conditions for sage-grouse on a case-by-case basis throughout the planning area could allow for more surface disturbance from oil and gas development activities overall. These exceptions would be considered on a case-by-case basis, and would need to be consistent with applicable RMPs, but any additional surface disturbances would lead to short-

term and long-term vegetation disturbance, increased overland flow, soil erosion, and sediment, salt, and excess nutrient transport to water bodies.

Not applying minimum lease sizes within sage-grouse core habitat areas may result in a greater number of smaller-sized leases within these areas. A greater number of leases and associated access roads and well pads could result in a greater amount of surface disturbances, vegetation removal, and subsequent soil erosion, runoff, and sediment, salt, and excess nutrient loading to water bodies.

Mitigation of oil and gas activity would lessen the impacts associated with oil and gas activities, including surface disturbance from construction of wells, well pads, roads, pipelines, and transmission lines. And, requiring reclamation bonds before any drillings or surface disturbing activities occur would help to ensure reclamation is completed, which would decrease soil erosion and sediment, salt, and excess nutrient loading.

Treating and disposing of produced water from CBNG in the Pinedale Field Office would improve water quality of both surface water and groundwater.

Surface and underground coal operations involve land-clearing, road development, construction of mining facilities, and surface disturbances. Surface coal mining in the Casper, Kemmerer, Pinedale, Rawlins, Rock Springs Field Offices, BTNF, and TBNG, allowing for coal exploration activities and considering leasing of non-energy leasable minerals within sage-grouse core habitat areas (Map 2-24) would remove and disturb vegetation and could result in short-term and long-term soil erosion, stream sedimentation, salt and excess nutrient loading, groundwater contamination, and augmented water flows. The magnitude of long-term soil erosion, sedimentation, and augmented water flows from these activities would depend on the duration of activity, as well as the type of reclamation efforts implemented and how long it would take for disturbed areas to become stabilized and vegetated. The amount of stream sedimentation would depend on proximity of the operation to a stream.

Alternatively, withdrawing core habitat areas from locatable mineral entry (Map 2-19) would decrease the amount of surface disturbing activities associated with mineral entry, thereby maintaining vegetation, soil stability, and local surface water quality.

Mineral material exploration, sales, and free use permit operations in sage-grouse core habitat areas (except areas that are unavailable), as well as geophysical surveys where allowed, would also lead to surface disturbances that would result in short-term and long-term soil erosion and sediment, salt, and excess nutrient loading to water bodies (Map 2-14) depending on the actual location of disturbances, as well as design features utilized to mitigate impacts. The magnitude of long-term soil erosion and sediment, salt, and excess nutrient loading to water bodies from mining activities and mineral exploration would depend on the duration of activity, as well as the type of reclamation efforts implemented and how long it would take for disturbed areas to become stabilized and vegetated.

Continuing to have salable mineral pits that are not in use remain available for other uses could result in continued runoff into the pit, in turn degrading the water quality within the pit. These impacts would likely be concentrated to the water within the mineral pits, but could affect groundwater quality if depending on the local water table.

Allowing dispersed recreation and SUPs, such as development of recreational trails, both motorized and non-motorized, holding one-time outfitting, guiding, and OHV events, and allowing camping could result in short-term localized surface disturbance, resulting in soil compaction, erosion, and increased localized runoff of sediment, salt, and excess nutrients into water bodies. Long-term impacts could also result, including stream channel degradation due to dispersed camping along streams, ATV and other vehicles

fording channels, fecal runoff from humans and animals into stream channels (increasing nutrients and bacteria), creation of multiple foot and livestock trails from campsites to and along streams, and loss of riparian vegetation and subsequent loss of stream shading and bank stability.

Managing the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area within the Casper, Kemmerer, Rawlins, and Rock Springs Field Offices, respectively, as OHV "open" areas would result in short-term and long-term impacts to vegetation and soil conditions. A one-time disturbance resulting from OHV use (excluding the "open" sand dune areas devoid of vegetation) could cause physical damage to these vegetated areas by breaking stems and branches and may disturb the soil surface depending on soil conditions, slope, and ground cover. Usually, with a one-time disturbance, plants and disturbed areas would recover. However, with repeated use, new trails would be established, and long-term loss of vegetation and soil compaction would occur, resulting in increased overland flow, channelization of overland flows, and decreased stream bank stability, soil erosion, and increased turbidity and sediment, salt, and excess nutrient loading to water bodies. The use of OHVs during periods of high soil moisture, such as early winter and spring, would also accelerate soil erosion and vegetation damage.

Applying vegetation treatment measures and management, including use of prescribed fire, rehabilitation, and restoration measures, resting treated areas in certain locations, and restricting surface disturbance in wintering range would maintain and increase the overall health and function of vegetation communities. Robust vegetation reduces soil erosion and overland flow. Application of these measures could result in short-term vegetation loss and subsequent soil erosion and excess sediment loading during treatment activities, but would maintain localized water quality over the long-term.

Closing and reclaiming roads, two-track routes, and trails, and reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a), Forest Service Manual (FSM) 2500, and the Clean Water Act (The Federal Water Pollution Control Act of 1972 [Public Law 92-500], as amended in 1977 [Public Law 95-217] and 1987 [Public Law 100-4]) could result in short-term vegetation removal and altered water flows, due to surface disturbing activities as part of the reclamation process, but would result in long-term improved vegetation health and function, unaltered water flows, and subsequent reductions in salt, sediment, and excess nutrient loading into nearby streams and rivers.

Applying distance prohibitions (68,550 acres) and restrictions (93,580 acres) on surface occupancy and disturbance activities near occupied sage-grouse leks inside and outside core habitat and connectivity areas would reduce the amount of surface disturbing activities resulting from newly permitted activities (Map 2-1) A reduction in surface occupancy and disturbances would decrease vegetation removal, soil compaction, overland flow, and sediment, salt, and excess nutrient transport to water bodies, and maintain the health and function of watershed resources and water quality in both the short-term and long-term.

Seasonal avoidance of surface disturbing and disruptive activities within sage-grouse nesting and early brood-rearing habitat inside sage-grouse core habitat and connectivity habitat areas, and inside sage-grouse winter concentration areas would decrease the amount of vegetation removal occurring, as specific areas would be completely closed to newly permitted activities during this time period. The reduction in removal of vegetation would reduce soil compaction, overland flow, and sediment, salt, and excess nutrient transport to water bodies. The effects would be short-term during the four months that prohibitions and restrictions are in effect, but could also be long-term if overall surface disturbance and occupancy decline.

4.18.4 Alternative B

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per *BLM Handbook H-1740-2* and *Forest Service Manual 2080* could result in short-term vegetation loss, soil erosion, and increased overland water flow, but would in the long-term improve the overall health and function of vegetation communities, compared to Alternative A, which would in turn reduce soil erosion and help to maintain local surface water quality over the long-term.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as, but not limited to, consolidation of infrastructure to reduce habitat fragmentation and loss, and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, would result in improved vegetation health, which would also reduce runoff and sediment loading in the short-term and long-term within sage-grouse habitat inside and outside of priority habitat areas, compared to Alternative A.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within sage-grouse priority habitats would result in impacts to soils similar to Alternative A. However, once travel management planning is complete, any additional routes designated would result in increased surface disturbance, soil erosion, and increased sediment, soil, and nutrient loading to nearby water bodies, while areas closed to motorized travel would result in a decrease of surface disturbance, soil erosion, and increased runoff to nearby water bodies.

No ROW and transmission projects would be authorized within sage-grouse priority and connectivity habitat areas, both inside and outside existing corridors. All sage-grouse priority habitat areas would be managed as exclusion areas and all general sage-grouse habitat areas as avoidance areas for new BLM ROW or Forest Service SUA permits (Map 2-10). Watershed resources and water quality within sage-grouse priority habitat areas would not be impacted, as surface disturbances resulting from utility corridor development would not occur. Relocating corridors outside of priority habitat would decrease impacts to watershed resources and water quality from surface disturbance inside the priority and connectivity habitat, but could result in greater surface disturbance and subsequent impacts to watershed resources and water quality outside of priority and connectivity habitat, if those corridors were to be developed.

As a ROW action, wind energy development as discussed under Alternative A would also be prohibited inside sage-grouse priority habitat areas (5,033,240 acres) (Map 2-30). This would result in larger prohibited areas, relative to Alternative A. Approximately 127 2-MW wind turbines are projected to be constructed, which would be 90% fewer turbines than under Alternative A. These restrictions would reduce the amount of soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies associated with wind energy development activities, compared to Alternative A.

Prohibiting the construction of MET towers in sage-grouse priority habitat areas would further reduce the amount of short-term soil erosion, runoff, and overland flow from these activities, compared to Alternative A, because MET towers would be prohibited in sage-grouse priority habitat areas throughout the planning area.

Incorporating a light grazing management strategy in sage-grouse priority habitat utilizing a 20-30% forage allocation for livestock would result in restrictions to grazing and associated surface disturbance, so the impacts to watershed resources and water quality from grazing would be similar to Alternative A. Designing new structural range improvements and locations of supplements in sage-grouse priority habitat to conserve, enhance, or restore sage-grouse habitat through an improved grazing management system relative to sage-grouse objectives would reduce impacts to watershed resources and water quality, compared to

Alternative A, as these activities would be designed to minimize surface disturbing activities. Planning and monitoring for invasive species due to these improvements would also reduce impacts to watershed resources and water quality, compared to Alternative A, as a healthy vegetative community would decrease soil erosion and runoff, and sediment, salt, and excess nutrient transport to water bodies.

Managing riparian areas and wet meadows for PFC or other similar methodology (Forest Service only) within sage-grouse priority habitats would further reduce impacts to watershed resources and water quality, compared to Alternative A, as these objectives would enhance the vegetation communities in these areas, thereby reducing soil erosion and overland flow to surface water. Authorizing new water development in sage-grouse priority habitats for diversion from spring or seep source only when priority sage-grouse habitat would benefit on both upland and riparian habitat from the development or there are no negative impacts to sage-grouse would reduce the extent of impacts to watershed resources and water quality, compared to Alternative A, as less water developments would likely be authorized, resulting in less surface disturbance, vegetation removal, and soil erosion. However, water quantity in the area could be impacted by creating the diversion, if the spring or seep fed into nearby surface water. Modifying water developments within sage-grouse priority habitat, including dismantling of water developments could result in short-term impacts to watershed resources and water quality from surface disturbance associated with the dismantling.

Exceptions to lease stipulations, COAs, and T&Cs for sage-grouse would not be considered within sage-grouse priority habitat. Vegetation loss, and subsequent soil erosion and sediment, salt, and excess nutrient transport to water bodies in the planning area would decrease, relative to Alternative A, as potential additional surface disturbances resulting from these exceptions would not occur.

Priority sage-grouse habitat would be closed to new fluid mineral leasing under this alternative (6,886,890 acres) and NSO stipulations would be applied on 2,117,160 acres (Map 2-5), which would be a 32% increase in closed areas compared to Alternative A. Under Alternative B, 11,555 BLM or Forest Service oil and gas wells and 2,154 CBNG wells would be anticipated in sage-grouse priority habitat and connectivity habitat areas, resulting in 104,050 acres that would be disturbed over the short-term (before reclamation), and 33,530 acres that would be disturbed over the long-term (after reclamation). The number of wells anticipated would be approximately 16% less than the amount of wells anticipated under Alternative A. Activities associated with oil and gas leasing, such as construction of well pads, roads, pipelines, and other surface disturbances would be reduced, as would the potential for groundwater withdrawal and injection in these areas. Vegetation removal, soil erosion, increased overland flow, and sediment, salt, and excess nutrient transport, both in the short term and long term, would decrease and protections to watershed resources and water quality would increase relative to Alternative A. Runoff and sediment transport would continue to decline as existing leases would not be re-offered once they expire.

Not applying minimum lease sizes within sage-grouse priority habitat areas would have the same impacts to watershed resources and water quality as discussed under Alternative A.

Allowing geophysical exploration within sage-grouse priority habitat areas would increase impacts to watershed resources and water quality, compared to Alternative A, because surface disturbing activities would be allowed within sage-grouse priority habitat areas, which would remove vegetation, destabilize the soil, and allow for greater runoff and sediment transport to local surface water bodies.

Applying conservation objectives throughout sage-grouse priority habitat would further reduce water resource impacts associated with oil and gas activity, compared to Alternative A, because the objectives would be more intensive, and COAs, minimization of impacts to priority habitat through project design, and mitigation requirements would be applied.

Not allowing new surface occupancy on existing federal fluid mineral leases within priority habitats would help to maintain the vegetation in these areas, which would minimize soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies. However, surface disturbance could occur if the lease is entirely within priority habitat, in which case localized vegetation loss and increased water runoff could occur.

Requiring unitization when necessary for proper development and operation of an area within sage-grouse priority habitat would result in less surface disturbance in the long-term, as operations equipment would be condensed into one unit. This would result in less soil erosion and sediment, salt, and excess nutrient transport over the long-term. In the short-term, there may be localized increases in soil erosion and runoff associated with the construction of the unit.

Requiring a full reclamation bond specific to the site in accordance with 43 CFR 3104.2, 3104.3, and 3104.5 would result in impacts to watershed resources and water quality similar to Alternative A.

The effects to watershed resources and water quality associated with treating and disposing of produced water from CBNG in the Pinedale Field Office described in Alternative A would not occur, as produced water could continue to be untreated and disposed of via current methods.

Finding all surface coal mining unsuitable within sage-grouse priority habitat would prohibit surface disturbing activities associated with surface coal mining within all the priority habitat in the planning area, as opposed to smaller, specific areas outlined in Alternative A, so impacts to watershed resources and water quality would be reduced, compared to Alternative A. Additionally, granting no new underground coal mining leases unless all surface disturbances (appurtenant facilities) are placed outside of the sage-grouse priority habitat area would decrease the impacts to watershed resources and water quality within priority habitat, compared to Alternative A, as no surface disturbing activities could occur. However, this could increase the amount of mining activity and associated surface disturbance outside priority habitat areas, compared to Alternative A. Additionally, if new facilities associated with existing leases cannot be located outside the sage-grouse priority habitat area, co-locating new facilities or building them to the absolute minimum standard necessary would decrease impacts to watershed resources and water quality, compared to Alternative A, as the surface disturbing activities would be more concentrated, resulting in less vegetation removal, soil erosion, and overland flow. Also, no coal exploration or new leases for other non-energy leasable minerals would be allowed inside sage-grouse priority habitat areas, which would reduce these impacts to watershed resources and water quality, relative to Alternative A where coal exploration would be allowed within this habitat.

Withdrawing sage-grouse priority habitat from locatable mineral entry based on the risk to sage-grouse and its habitat from conflicting locatable mineral potential and development would result in impacts to watershed resources and water quality similar to Alternative A (Map 2-20). If they are not withdrawn, there would be an increase in surface disturbing activities, which would result in an increase of vegetation removal, soil erosion and overland flow, and sediment, salt, and excess nutrient transport in the short-term. In the long-term, these areas would be mitigated, and the impacts would be similar to Alternative A.

Mineral material exploration, sales, and free use permits would be closed in sage-grouse priority habitat areas, subject to valid existing rights (Map 2-15). A reduction in these operations would reduce the amount of associated surface disturbance, and subsequently reduce soil erosion and overland flow, and sediment, salt, and excess nutrient transport, compared to Alternative A.

Restoring salable mineral pits no longer in use would decrease impacts to watershed resources and water quality compared to Alternative A, because localized vegetation would be established, and soil erosion and runoff into any surface water within the pits would decrease in the long-term.

Allowing BLM SRPs and Forest Service RSUAs in priority habitat that have neutral or beneficial effects to priority habitat areas would decrease the extent of impacts to watershed resources and water quality, compared to Alternative A, in priority habitat, as maintaining soil health and stability would be a beneficial effect to reducing erosion and overland flow into surface water bodies.

Designating all OHV "open" areas within sage-grouse priority habitat areas as limited to designated roads and trails, including the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area, and continuing to manage the sand dune portions of these areas where roads to do not exist as "open," would result in less surface disturbance, soil erosion, sediment transport, and overland flow compared to Alternative A.

Using existing roads within priority habitat, and not allowing upgrading of existing routes that would change route category or capacity would minimize overland water flow. However, if new roads are constructed, or necessary route upgrades would occur, short-term loss of vegetation and subsequent soil erosion and runoff would occur, until mitigation efforts were successful in revegetation and soil stabilization. Restoration of roads, primitive roads, and trails not designated in travel management plans within priority habitat would result in similar impacts to Alternative A, but to a larger extent as all priority habitat would be subject to this action.

Management of vegetation in sage-grouse priority habitat would increase the overall health and function of vegetation communities, compared to Alternative A, because a larger area of the planning area would be managed. Measures to not reduce sagebrush canopy cover in priority habitat to less than 15% unless required would maintain vegetative cover, which would in turn maintain soil stability and reduce soil erosion, thereby maintaining the water quality of streams and water bodies in the area, compared to Alternative A.

Only allowing for vegetation treatments that conserve, enhance, or restore sage-grouse habitat in priority habitat, including restoration of burned areas, ensuring long-term persistence of native plants within priority sage-grouse habitats, and not using prescribed fire in less than 12 inch precipitation zones, and resting treated areas for two full growing seasons would increase long-term localized surface water quality, compared to Alternative A, because a larger area (entire priority habitat) would be subject to this action. Requiring treatments in known sage-grouse winter range to maintain habitat quality would reduce the impacts to water quality from these treatments, compared to Alternative A, as the entire winter range within the planning area would be subject to this requirement.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a) and FSM 2500 would have the same impacts discussed under Alternative A. Identifying areas within sage-grouse priority habitat for vegetation restoration would establish vegetative cover, thereby reducing the amount of soil erosion, overland water flow, and sediment, salt, and excess nutrient loading that occurs in both the short-term and long-term.

Managing discrete anthropogenic disturbances within sage-grouse priority and connectivity habitat areas would increase protection to watershed resources and water quality within these areas over the long-term. Density of disturbance on the landscape would not exceed 3% disturbance within the total sage-grouse habitat, and an average of 3% disturbance per 640 acres (within sage-grouse connectivity habitat areas). These limits would reduce the amount of surface disturbance in these areas, which would reduce vegetation removal and soil erosion, help maintain watershed health by reducing the amount of sediment, salt, and excess nutrient transport to water bodies.

Not allowing new surface occupancy within sage-grouse priority habitat and connectivity habitat, including winter concentration areas, would result in impacts to watershed resources and water quality similar to

Alternative A, except the prohibited area would increase. If a lease is located entirely within priority habitat, a four-mile perimeter would apply with a limit to one disturbance per section, and with no more than 3% surface disturbance in that section. This increased area of restrictions would limit the amount of surface occupancy and soil disturbance in these areas, and also decrease resulting soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies, relative to Alternative A.

Prohibiting surface disturbing activities during the nesting and early brood-rearing season within all sage-grouse nesting/early brood-rearing habitat and winter concentration areas inside priority habitat areas, and within sage-grouse winter concentration areas would reduce vegetation removal, erosion, runoff, and sediment, salt, and excess nutrient loading compared to Alternative A, as the prohibitions would expand to a larger area.

4.18.5 Alternative C

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per *BLM Handbook H-1740-2* and *Forest Service Manual 2080* would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as, but not limited to, consolidation of infrastructure to reduce habitat fragmentation and loss and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until travel management planning is complete and routes are either designated or closed within sage-grouse priority habitats would have the same impacts to watershed resources and water quality as under Alternative A.

The impacts associated with utility corridor designations discussed in Alternative A would not be realized. Relocating corridors outside of priority habitat would result in impacts to watershed resources and water quality as similar to Alternative B.

Managing sage-grouse priority and general habitat areas as ROW exclusion areas for new ROW or SUA permits (Map 2-11) would decrease impacts to watershed resources and water quality, compared to Alternative A, because 11,270,560 more acres would be excluded from surface disturbance associated with ROW or SUA permits.

Impacts to watershed resources and water quality from managing sage-grouse general habitat areas as ROW avoidance areas discussed in Alternative A would not be realized.

Wind energy development activities would be prohibited inside sage-grouse priority and general habitat areas (11,531,340 acres) (Map 2-31), which would be a greater prohibited area, relative to Alternative A. Approximately 127 2-MW wind turbines are projected to be constructed, which would be 90% fewer turbines than under Alternative A. These prohibitions would reduce the amount of surface disturbance, vegetation removal, overland flow, and subsequent sediment, salt, and excess nutrient transport to water bodies associated with wind energy development activities, compared to Alternative A.

Authorizing the construction of MET towers in certain areas, and on a case-by-case basis would have the same impacts to watershed resources and water quality as discussed under Alternative A.

Industrial solar projects result in short-term surface disturbance associated with solar field construction, panel placement, and transmission lines. Prohibiting industrial solar projects in ACECs and occupied sage-grouse habitats would result in increased protections to watershed resources and water quality in these areas, because no increased vegetation removal, soil erosion, and sediment, salt, and excess nutrient transport to water bodies associated with surface disturbing activities would occur. However, this action could result in a higher concentration or size of industrial solar projects outside these areas, which would result in increased surface disturbance and associated impacts to watershed resources and water quality outside ACECs and occupied sage-grouse habitats.

Prohibiting livestock grazing within sage-grouse priority habitat and avoiding new structural range developments in sage-grouse priority and general habitat would decrease impacts to watershed resources and water quality, compared to Alternative A. No surface disturbing activities associated with livestock grazing would occur, so vegetation would be maintained, soil compaction would be minimized, and excess runoff and overland flow would not occur in this area and range developments would be less likely to occur due to avoidance stipulations, and the area of these stipulations would be larger.

Ensuring that soil cover and native herbaceous plants are at their ESD within sage-grouse habitat would help to maintain vegetation health and minimize soil erosion, runoff, and excessive sediment, salt, and nutrient transport to water bodies.

Managing riparian areas and wet meadows for PFC or other similar methodology (Forest Service only) within sage-grouse priority habitats would further reduce impacts to watershed resources and water quality, as these objectives would enhance the vegetation communities in these areas, thereby reducing soil erosion and overland flow to surface water. Additionally, within sage-grouse priority and general habitats, wet meadows would be managed to maintain a component of perennial forbs with diverse species richness and productivity relative to site potential (e.g., reference state) and at least six inches of stubble height would remain on all riparian/meadow area herbaceous species at all times, which would further stabilize soil, preventing runoff and excess sediment, salt and nutrient transport to nearby surface water, compared to Alternative A. Not authorizing any new water developments for diversion from spring or seep sources within sage-grouse priority and general habitats would decrease impacts to watershed resources and water quality, compared to Alternative A, as there would be less surface disturbance, vegetation removal, and soil erosion within priority and general habitat. However, water quantity in the area could be impacted by creating the diversion, if the spring or seep fed into nearby surface water. Modifying water developments within sage-grouse habitat, including dismantling of water developments would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Exceptions to lease stipulations, COAs, and T&Cs for sage-grouse would not be considered within sage-grouse priority and general habitat. Vegetation loss and subsequent soil erosion, runoff, and sediment, salt, and excess nutrient loading to water bodies would decrease, relative to Alternative A, as potential additional surface disturbances resulting from these exceptions would not occur.

Closing priority sage-grouse habitat to fluid mineral leasing would result in 16,878,220 acres that would be closed, an increase of nearly 20 times the area closed under Alternative A (Map 2-6). Impacts to watershed resources and water quality would be reduced, compared to Alternative A, as vegetation removal, soil erosion and runoff, and sediment, salt, and excess nutrient loading to water bodies would greatly decrease. Under this alternative, 9,533 BLM or Forest Service oil and gas wells and 1,594 CBNG wells would be anticipated in sage-grouse priority habitat and connectivity habitat areas, 32% less than Alternative A. This would result in 85,140 acres that would be disturbed over the short-term (before reclamation), and 27,030 acres that would be disturbed over the long-term (after reclamation).

Not applying minimum lease sizes within sage-grouse priority habitat areas would have the same impacts to watershed resources and water quality as discussed under Alternative A.

Not allowing any new geophysical exploration within sage-grouse priority and general habitat areas would decrease impacts to watershed resources and water quality, compared to Alternative A, in the long-term because no new geophysical exploration and associated surface disturbance would be allowed within sage-grouse priority habitat areas.

Applying conservation objectives throughout the planning area would further reduce water resource impacts associated with oil and gas activity, compared to Alternative A, because the objectives would be more intensive, and COAs, minimization of impacts to priority habitat through project design, and mitigation requirements would be applied.

Not allowing new surface occupancy on existing federal fluid mineral leases within priority habitats would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Requiring unitization when necessary for proper development and operation of an area within sage-grouse priority habitat would have the same impacts to watershed resources and water quality discussed under Alternative B.

Requiring a full reclamation bond specific to the site in accordance with 43 CFR 3104.2, 3104.3, and 3104.5 would result in impacts to watershed resources and water quality similar to Alternative A.

Prohibiting the construction of evaporation or infiltration reservoirs to hold CBNG wastewater would have impacts similar to Alternative A, but with a greater magnitude as this prohibition would be required throughout the planning area.

Finding all surface coal mining unsuitable and not allowing new leases for other non-energy leasable minerals within sage-grouse priority habitat would prohibit surface disturbing activities associated with these activities throughout the habitat, as opposed to smaller, specific areas outlined in Alternative A, so impacts to watershed resources and water quality would be reduced, compared to Alternative A. Additionally, granting no new underground coal mining leases unless all surface disturbances (appurtenant facilities) are placed outside of the sage-grouse priority habitat area would decrease the impacts to watershed resources and water quality within priority habitat, compared to Alternative A, as no surface disturbing activities could occur. However, this could increase the amount of short-term surface disturbance outside priority habitat areas, compared to Alternative A. Additionally, if new facilities associated with existing leases cannot be located outside the sage-grouse priority habitat area, co-locating new facilities or building them to the absolute minimum standard necessary would decrease impacts to watershed resources and water quality, compared to Alternative A, as the surface disturbing activities would be more concentrated, resulting in less vegetation removal, soil erosion and runoff, and sediment, salt, and excess nutrient transport to water bodies.

Proposing withdrawal from locatable mineral entry based on risk to the sage-grouse and its habitat from conflicting locatable mineral potential and development (Map 2-21) would result in the same impacts to watershed resources and water quality as discussed under Alternative B.

Mineral material exploration, sales, and free use permits would be closed in sage-grouse priority habitat areas, subject to valid existing rights (Map 2-16). A reduction in these operations would reduce the amount of associated surface disturbance, and subsequently reduce soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies, compared to Alternative A.

Restoring salable mineral pits no longer in use would decrease impacts to watershed resources and water quality compared to Alternative A, because localized vegetation would be established, and soil erosion and runoff into any surface water within the pits would decrease in the long-term.

Allowing BLM SRPs and Forest Service RSUAs in priority habitat that have neutral or beneficial effects to priority habitat areas would decrease the extent of impacts to watershed resources and water quality, compared to Alternative A, in priority habitat, as maintaining soil health and stability would be a beneficial effect to reducing erosion and overland flow into surface water bodies.

Managing the OHV use in the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area as "open," in addition to managing all other OHV "open" areas within sage-grouse priority habitat areas as "limited to designated roads and trails," would result in impacts to watershed resources and water quality similar to Alternative A. If recreational riders avoided these areas, vegetation would return, soil stability would improve, and soil erosion would decrease.

Limiting route construction to realignments of existing designated routes within priority and general habitat, not allowing upgrading of existing routes that would change route category or capacity unless necessary, and mitigating any impacts with demonstrated methods to offset the loss of sage-grouse habitat would have impacts to watershed resources and water quality similar to Alternative B, but to a lesser extent as these requirements would apply to a greater area (priority and general sage-grouse habitat, as compared to only priority habitat under Alternative B). Restoration of roads, primitive roads, and trails not designated in travel management plans within priority habitat would result in similar impacts to watershed resources and water quality discussed under Alternative A, but to a larger extent as all priority habitat would be subject to this action.

Not reducing sagebrush canopy cover in priority and general habitat to less than 15% unless strategically required for habitat protection and conservation would in turn maintain soil stability and reduce soil erosion, thereby maintaining the water quality of streams and water bodies in a larger area, compared to Alternative A.

Only allowing for vegetation treatments that conserve, enhance, or restore sage-grouse habitat in priority and general habitat would have similar effects to watershed resources and water quality as Alternative B, but to a greater extent, as the area managed would be larger. Requiring fuels treatments in known sage-grouse winter range to maintain habitat quality would reduce the impacts to watershed resources and water quality from these treatments, compared to Alternative A, as the entire winter range within the planning area would be subject to this requirement. And, avoiding sagebrush reduction/treatments in sage-grouse priority and habitat areas, and including plans to restore high-quality habitat in areas with invasive species would stabilize the vegetative community and minimize soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a) would have the same impacts to watershed resources and water quality discussed under Alternative A. Rehabilitating and restoring vegetation within sage-grouse priority and general habitat would stabilize soil, helping to prevent overland water flow and sediment transport, compared to Alternative B, because a larger area would be restored.

Not using fire to treat sagebrush in less than 12-inch precipitation zones, unless as a last resort, would result in less surface disturbance and associated impacts to watershed resources and water quality compared to Alternative A, because a larger area (priority and general sage-grouse habitat) would be restricted from use of prescribed fire. If fire is used as a last resort, impacts to watershed resources and water quality would be similar to those discussed under Alternative A.

Ensuring long-term persistence of native plants, including sagebrush, within sage-grouse priority and general habitat, would have similar effects to watershed resources and water quality as those discussed under Alternative B, but to a greater extent, as a larger area would be included.

Excluding livestock grazing from burned areas until woody and herbaceous plants achieve sage-grouse habitat objectives, and closing sage-grouse priority and general habitat to grazing until recovered, would protect surface water quality within sage-grouse priority and general habitat by allowing vegetation communities to become established, soil to stabilize, and excess sediment and salt transport to surface water to decrease.

Not allowing new surface occupancy within sage-grouse priority habitat and connectivity habitat, including winter concentration areas, would result in impacts to watershed resources and water quality similar to Alternative A, except the prohibited area would increase. If a lease is located entirely within priority habitat, a four-mile perimeter would apply with a limit to one disturbance per section, and with no more than 3% surface disturbance in that section. This increased area of restrictions would limit the amount of surface occupancy and soil disturbance in these areas, and also decrease resulting soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies, relative to Alternative A.

Prohibiting surface disturbing and disruptive activities during the nesting and early brood-rearing season within all sage-grouse nesting/early brood-rearing habitat inside and outside priority, general, and connectivity habitat, and within sage-grouse winter concentration areas inside sage-grouse priority habitat areas would reduce soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies, compared to Alternative A, as surface disturbance prohibitions would expand to a larger area.

4.18.6 Alternative D

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per *BLM Handbook H-1740-2* and *Forest Service Manual 2080* would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as, but not limited to, consolidation of infrastructure to reduce habitat fragmentation and loss, and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within sage-grouse core and connectivity habitat would have the same impacts to watershed resources and water quality as discussed under Alternative A.

Managing sage-grouse core and connectivity habitat areas as ROW exclusion areas for new ROW or SUA permits, and limiting ROWs and transmission projects in existing utility corridors within a designated two-mile wide corridor through sage-grouse core and connectivity habitat areas or within 0.5 miles on either side of existing 115 kV or larger transmission lines, between July 1 and March 14 (or between July 1 and November 30 in winter concentration areas) would result in a greater area open for surface disturbances associated with these projects (Map 2-12). Impacts to watershed resources and water quality would decrease, compared to Alternative A, because 4,944,180 more acres would be excluded from surface disturbance and subsequent vegetation removal, soil erosion, and runoff associated with ROW or SUA permits.

Alternatively, allowing general sage-grouse habitat areas to be available for new ROWs or SUAs, subject to BMPs, would result in increased impacts to watershed resources and water quality, compared to Alternative A, because these areas would be available for ROW utility placement, which would result in surface disturbance, vegetation removal, soil erosion, and sediment, salt, and excess nutrient transport to water bodies.

Impacts to watershed resources from wind energy development would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,608,420 acres (Map 2-32). As a result, 980 2-MW wind turbines would be constructed (22% fewer turbine than under Alternative A), which would decrease construction activities and related impacts to watershed resources.

Authorizing the construction of MET towers in certain areas, and on a case-by-case basis, would have the same impacts to watershed resources and water quality as under Alternative A.

Utilization of BLM and Forest Service guidance to evaluate land health standards achievement would have the same impacts to watershed resources and water quality as discussed under Alternative A. Continuing to evaluate and modify when necessary, existing range improvements associated with grazing management operations for reducing impacts on sage-grouse and its habitat within sage-grouse general and core habitat, would result in reduced impacts to watershed resources and water quality, compared to Alternative A, as these range improvement activities would be evaluated and modified to minimize surface disturbing activities.

Balancing grazing in sage-grouse core and connectivity habitat between riparian habitats and upland habitats would further decrease impacts to watershed resources and water quality, compared to Alternative A, because riparian and upland vegetation communities would be maintained in a larger area of the planning area, which would decrease the surface disturbance associated with livestock grazing, maintaining a larger area of upland and riparian vegetation communities, and in minimizing soil erosion and excess overland water flow to nearby surface water. Within sage-grouse core and connectivity habitat, authorizing water developments as needed to support grazing objectives would decrease the extent of impacts to watershed resources and water quality, compared to Alternative A, as the likelihood of new water developments and subsequent surface disturbance would decrease.

Continuing exceptions to lease stipulations, COAs, and terms and conditions for sage-grouse within sage-grouse core and general habitat on a case-by-case basis would have the same impacts to watershed resources and water quality as discussed under Alternative A.

Allowing fluid mineral leasing would have impacts to water resources similar to those discussed in Alternative A, except to a lesser extent, as more acres would be closed to leasing compared to Alternative A. Under this Alternative, 964,860 acres would be closed and 2,117,990 acres would be managed with CSU stipulations (Map 2-7). Approximately 13,083 BLM or Forest Service oil and gas wells and 2,686 CBNG wells would be anticipated in sage-grouse core habitat and connectivity habitat areas, 4% less than in Alternative A, resulting in 122,910 acres that would be disturbed over the short-term (before reclamation), and 37,720 acres that would be disturbed over the long-term (after reclamation).

Not applying minimum lease sizes within sage-grouse core and connectivity habitat areas would have the same impacts to watershed resources and water quality as discussed under Alternative A.

Impacts to watershed resources and water quality from geophysical surveys would be the same as those discussed under Alternative A.

Working with proponents during oil and gas leasing to promote measurable sage-grouse conservation objectives could reduce the impacts to watershed resources and water quality, if conservation objectives would include minimization of vegetation removal, stabilization of soil, and control of overland water flow and sediment, salt, and excess nutrient transport to water bodies, compared to Alternative A.

Actions to minimize impacts to sensitive resources, including vegetation, and requiring reclamation bonds before any drillings or surface disturbing activities occur would result in the same impacts to watershed resources and water quality as discussed under Alternative A.

Using unitization for orderly development of an area within sage-grouse core and connectivity habitat would have the same impacts to watershed resources and water quality as discussed under Alternative B.

The impacts associated with treating and disposing of produced water from CBNG in the Pinedale Field Office described in Alternative A would not occur.

Surface mining could occur in sage-grouse core and connectivity habitat, but could not have a significant long-term impact on the sage-grouse. Therefore, surface disturbance, where it did occur, would have impacts to watershed resources and water quality similar to Alternative A, but the extent of impacts would be less. Underground coal mining and allowing for coal exploration activities within sage-grouse core and connectivity habitat areas (Map 2-27) would also have the same impacts to watershed resources and water quality discussed under Alternative A.

Consideration of all non-energy leasable mineral activities in sage-grouse core and connectivity habitat would result in similar impacts to watershed resources and water quality if these activities were allowed. If they were not allowed, impacts to watershed resources and water quality would be reduced, compared to Alternative A, as surface disturbance associated with these activities would not occur.

Withdrawing core and connectivity habitat areas from locatable mineral entry (Map 2-22), opening sage-grouse core and connectivity habitat areas to mineral material exploration, sales, and free use permits (Map 2-17), and continuing to have salable mineral pits not in use available for other uses would all result in the same impacts to watershed resources and water quality as discussed under Alternative A.

Approving BLM SRPs and Forest Service RSUAs in sage-grouse priority habitat on a case-by-case basis would have impacts to watershed resources and water quality similar to Alternative A, except the area would be larger. If not approved, impacts to watershed resources and water quality would be the same as discussed under Alternative A.

Managing the Poison Spider OHV Park, part of the hill climb area in Section 33, T15 North, R114 West, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area as OHV “open” areas would have the same impacts to watershed resources and water quality discussed under Alternative A.

New road construction would be avoided within 0.25 miles of occupied sage-grouse leks within sage-grouse core and connectivity habitat areas. These restrictions would lessen the amount of surface disturbance and resulting vegetation removal, soil erosion, runoff, and sediment, salt, and excess nutrient loading to water bodies, but not to the same extent as Alternative A, as this would be an avoidance rather than a prohibition as in Alternative A.

Allowing road upgrades within sage-grouse core, connectivity, and general habitat could result in short-term impacts to watershed resources and water quality similar to Alternative A. Allowing natural deterioration of roads within sage-grouse core, connectivity, and general habitat would decrease impacts to

watershed resources and water quality, compared to Alternative A, but in the short-term the effects would not be as great as Alternative A, due to the lack of active restoration. In the long-term, effects would be greater than Alternative A because the area is larger. However, if vegetation could not be established, impacts to watershed resources and water quality would be greater than Alternative A, as non-maintained roads may produce more sediment and runoff if there are drainage issues, culverts are plugged, or slides are active in the area.

Managing for vegetation composition and structure that reflects desired plant community or comparable standard within sage-grouse core and connectivity habitat would increase the overall health and function of vegetation communities, thereby minimizing soil erosion and runoff to water bodies, compared to Alternative A, as a larger area of the planning area would be managed.

Using the *WGFD Protocols for Treating Sagebrush to Benefit Sage-Grouse* for vegetation treatments in core and connectivity habitat areas would result in impacts to watershed resources and water quality similar to Alternative B, except the effects would be more intense as treatment proposals would be subject to these additional protocols.

Not resting treated areas could increase impacts to watershed resources and water quality, compared to Alternative A, because grazing could lead to surface disturbance, vegetation loss, soil compaction and erosion, and excess sediment, salt, and nutrient transport to nearby water bodies.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a), rehabilitation and restoration measures that occur after wildland fire, and use of prescribed fire would all have the same impacts to watershed resources and water quality as discussed under Alternative A.

Managing the density of energy production (excluding coal and trona mining) and/or transmission structures (excluding buried pipelines or power lines) on the landscape inside sage-grouse core and connectivity habitat areas would increase impacts to watershed resources and water quality within the planning area long-term, compared to Alternative B. A limit of three energy production locations and/or transmission structures per 640 acres within the DDCT would be allowed under this alternative, regardless of the percent disturbance in Alternative B, and a greater limit of sagebrush habitat loss (9%) would be allowed under this alternative, compared to the limit of 3% surface disturbance (and subsequent sagebrush loss) in Alternative B.

Prohibiting surface occupancy and disturbance around sage-grouse leks, including new road construction, inside and outside sage-grouse core and connectivity habitat areas would result in impacts to watershed resources and water quality similar to Alternative A, except the area prohibited would decrease. Surface disturbing activity and surface occupancy would be prohibited within 0.25 miles of occupied sage-grouse leks across the planning area. Surface disturbing activities from newly permitted activities would not be prohibited within the planning area, but would be restricted on 75,870 acres (Map 2-2). Compared to Alternative A (under which surface disturbance would be prohibited on 68,550 acres and restricted on 93,580 acres), these actions would allow for a greater area of surface disturbance and subsequent vegetation removal, soil erosion, runoff, and sediment, salt, and excess nutrient loading to water bodies.

Applying seasonal surface disturbing and/or disruptive activity restrictions within sage-grouse nesting and early brood-rearing habitat inside and outside sage-grouse core habitat and connectivity habitat areas during the sage-grouse nesting season, and prohibitions within sage-grouse winter concentration areas and areas supporting connectivity populations inside sage-grouse core habitat areas would increase protections to watershed resources and water quality, relative to Alternative A, as timing and area would be expanded.

4.18.7 Proposed Land Use Plan Amendments

Controlling, suppressing, and eradicating noxious weeds and working to restore and maintain native plant communities per *BLM Handbook H-1740-2* and *Forest Service Manual 2080* would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Working with proponents to ensure measurable sage-grouse conservation objectives, such as, but not limited to, consolidation of infrastructure to reduce habitat fragmentation and loss, and effective conservation of seasonal habitats and habitat connectivity to support management objectives set by the WGFD, are included in all project proposals, would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until travel management planning is complete and routes are either designated or closed within PHMAs would have the same impacts to watershed resources and water quality as under Alternative A.

Allowing new transmission projects in existing utility corridors within a designated two-mile wide corridor through PHMAs, or within 0.5 miles on either side of existing 115 kV or larger transmission lines would result in the same impacts to watershed resources and water quality as discussed under Alternative A, but the intensity would be less, as new transmission projects in existing utility corridors would be subject to more surface disturbance stipulations and review designed to protect sage-grouse populations in PHMAs. These would include the use of the *Framework for Sage-Grouse Impacts Analysis for Interstate Transmission Lines* or other appropriate documents and prohibiting surface disturbing and/or disruptive activities from March 15 to June 30. New ROW or SUAs could be issued in existing designated ROW corridors with appropriate sage-grouse seasonal timing constraints, which could reduce impacts to watershed resources and water quality, but not to the extent as in Alternative B, because surface disturbance associated with ROWs and SUAs would likely still occur, subject to timing requirements and demonstrations development activity would not result in declines of PHMA populations.

Managing PHMAs as ROW avoidance areas for new ROW or SUA permits (Map 2-13) would result in similar impacts to watershed resources and water quality as discussed under Alternative A, except there would be more avoidance areas, which could increase the extent of impacts to watershed resources and water quality.

Co-locating new ROWs/SUAs, where feasible, would result in decreased impacts to watershed resources and water quality, compared to Alternative A, because surface disturbance associated with new ROWs/SUAs would be in a concentrated area, which would minimize the amount of vegetation removal, soil compaction and erosion, and excess sediment, salt, and nutrient transport to water bodies associated with these activities. Timing restraints would have no effect because the surface disturbance could still occur at other times of the year.

The impacts to watershed resources from wind energy development would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,731,350 acres (Map 2-33). As a result, 127 2-MW wind turbines would be constructed (90% fewer turbine than under Alternative A), which would decrease construction activities and related impacts to watershed resources. Impacts to watershed resources and water quality from MET tower construction would be reduced, compared to Alternative A, because the siting perimeter avoidance area would be larger.

Utilization of BLM and Forest Service guidance to evaluate land health standards progress towards or achievement in PHMAs would have the same impacts to watershed resources and water quality as discussed under Alternative A. Continuing to evaluate and modify when necessary, existing range improvements for

impacts on sage-grouse and its habitat within PHMAs and GHMAs, would result in reduced impacts to watershed resources and water quality, compared to Alternative A, as these range improvement activities would be evaluated and modified to minimize surface disturbing activities. Continuing to authorize mineral, salt, and nutritional supplements and supplemental feeding for livestock where appropriate would result in impacts to watershed resources and water quality as discussed under Alternative A.

Balancing grazing in PHMAs between riparian habitats and upland habitats would further decrease impacts to watershed resources and water quality, compared to Alternative A, because riparian and upland vegetation communities would be maintained in a larger area of the planning area, which would decrease the surface disturbance associated with grazing, maintaining a larger area of upland and riparian vegetation communities and their function, and reducing the amount of sediment, salt, and nutrient transport to nearby surface water. Evaluating and modifying water developments that have a negative effect on PHMAs would have the same impacts to watershed resources and water quality as discussed under Alternative B.

Continuing exceptions to lease stipulations, COAs, and terms and conditions for sage-grouse within PHMAs and GHMAs on a case-by-case basis would have the same impacts to watershed resources and water quality as under Alternative A.

Allowing fluid mineral leasing would have impacts to water resources similar to those discussed in Alternative A, except to a lesser extent, as more areas would be closed to leasing and managed with NSO and CSU stipulations, compared to Alternative A. Approximately 883,670 acres would be closed to leasing, 441,690 acres would be managed with NSO stipulations and 6,438,480 acres would be managed with CSU stipulations (Map 2-8). Under this Alternative, 12,355 BLM or Forest Service oil and gas wells and 2,462 CBNG wells would be anticipated in available PHMAs, 10% less than Alternative A. A total of 112,330 acres would be disturbed over the short term (before reclamation), and 35,430 acres would be disturbed over the long term (after reclamation). The agencies would allow oil and gas leasing consistent and subject to the leasing stipulations analyzed in the timing, distance, disturbance, and density restrictions sections (Appendix D).

Application of a minimum lease size of 640 acres within PHMAs on BLM-administered lands would help to prevent fragmentation and increased numbers of smaller-sized leases by reducing the potential for increased surface disturbance and subsequent vegetation removal and soil erosion and runoff to water bodies, relative to Alternative A. There would be exceptions for leases smaller than 640 acres, such as for regulatory compliance, but these exceptions would likely not be numerous enough to outweigh the reduction in runoff and nutrient loading from minimum lease sizes.

Allowing geophysical exploration projects within PHMAs, except where prohibited or restricted by existing LUP decisions, would reduce the extent of impacts to watershed resources and water quality, compared to Alternative A, because the projects would be designed to minimize habitat fragmentation within PHMAs, which would reduce the amount of surface disturbance, vegetation removal, soil erosion, and excess overland flow and sediment transport to water bodies associated with these projects.

Requiring any development within PHMAs to be placed in the area least harmful to sage-grouse based on vegetation, topography, or other habitat features would have impacts to watershed resources similar to Alternative A, but to a greater extent within PHMAs. These requirements could reduce the amount of soil erosion, runoff, and sediment, salt, and excess nutrient transport to water bodies, relative to Alternative A, if projects are located in areas with the least sensitive and susceptible vegetation and soils vulnerable to erosion and runoff. However, soil erosion, runoff, and sediment, salt, and excess nutrient transport would still occur from project-related surface disturbances, regardless of where the disturbance is located.

Encouraging unitization within PHMAs would have the same impacts to watershed resources and water quality as discussed under Alternative B where it is utilized. Areas within PHMAs where unitization is not utilized could have increased impacts to watershed resources and water quality, compared to Alternative B, as more areas may be developed and undergo surface disturbance, vegetation removal, soil erosion, and sediment, salt, and excess nutrient transport to water bodies.

Requiring reclamation bonds or partial reclamation bonds commensurate with the scope, scale, size of the project within PHMAs would result in impacts to watershed resources and water quality similar to Alternative A.

Treating and disposing of produced water from CBNG activity within the Pinedale Field Office would have the same impacts discussed under Alternative A.

Under this Alternative, surface mining and underground coal mining could occur in PHMAs (Map 2-28), but it could not have a significant long-term impact on the sage-grouse. Therefore, surface disturbance, where it did occur, would have impacts to watershed resources and water quality similar to Alternative A, but the long-term extent of impacts would be less. Allowing coal exploration activities in PHMAs would result in impacts to watershed resources and water quality similar to Alternative A, as these activities could occur within PHMAs, but the extent would be less due to surface occupancy and disturbance and density stipulations, which may reduce vegetation removal and subsequent soil erosion and excessive nutrient loading, if the analyses and potential mitigation measures result in revegetation and soil stabilization.

Consideration of all non-energy leasable mineral activities in PHMAs would result in impacts to watershed resources and water quality similar to Alternative A, if allowed. If they were not allowed, impacts to watershed resources and water quality would be reduced, compared to Alternative A, as surface disturbance associated with these activities, and subsequent vegetation removal, soil erosion, and excess sediment, salt, and nutrient transport to water bodies would not occur.

Impacts to watershed resources and water quality from withdrawal of areas within PHMAs from mineral entry on BLM-administered lands would be similar to those identified under Alternative A, except areas proposed for withdrawal and considered for proposed withdrawal would increase to 1,146,220 acres (Map 2-23). This could decrease surface disturbances, vegetation removal, soil erosion, and related impacts to water resources associated with locatable mineral development activities.

Impacts to watershed resources and water quality from mineral material exploration, sales, and free use permit operations (Map 2-18) would be similar to Alternative A, except in PHMAs where restrictions to surface disturbance and disruptive activity may result in less surface disturbance, vegetation removal, soil erosion, and sediment, salt, and excess nutrient transport to water bodies inside these areas. However, these operations may be sited outside of PHMAs, in which case the impacts to watershed resources and water quality would be the same as Alternative A.

Considering closure and restoration of salable mineral pits no longer in use would result in similar impacts to watershed resources and water quality as under Alternative A if the mineral pit is not restored, and would decrease impacts to watershed resources and water quality compared to Alternative A, if restored, as localized vegetation would be established, and soil erosion and runoff into any surface water within the pits would decrease in the long-term.

Allowing BLM SRPs and Forest Service RSUAs in PHMAs unless negative impacts to sage-grouse cannot be adequately mitigated would have impacts to watershed resources and water quality similar to Alternative A, except in cases where BLM SRPs and Forest Service RSUAs are approved, in which case

surface disturbance would occur, and impacts to watershed resources and water quality would increase in the short-term, until those impacts were mitigated.

Designating all OHV "open" areas within PHMAs as limited to existing roads and trails, and allowing the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area, and continuing to manage the sand dune portions of these areas where roads to do no exist as "open," would result in greater protections to watershed resources and water quality, compared to Alternative A, if recreational riders avoided these areas, as vegetation would return, soil stability would be maintained, and soil erosion, runoff, and excess nutrient transport would decrease.

Using existing roads, and not allowing upgrading of existing routes unless there would be minimal impact to PHMAs, or is necessary, would result in impacts to watershed resources and water quality similar to Alternative B, except the area of surface disturbance could be larger, because of the 5% limit, versus the 3% limit in Alternative B. If the disturbance is less than 5%, but greater than 3%, mitigation would not be necessary, which would then result in loss of vegetation, soil erosion, and increased overland water flow in the short term until mitigation efforts result in revegetation and soil stabilization. Allowing natural reclamation of roads and trails within PHMAs (core only) would have impacts to watershed resources and water quality similar to Alternative A, except this action would also include those not designated in WSAs, and within lands with wilderness characteristics that have been selected to be managed to retain those characteristics for protection.

Management of vegetation in PHMAs and deferring grazing on treated areas for two full growing seasons would increase the overall health and function of vegetation communities, compared to Alternative A, because a larger area of the planning area would be managed. Not conducting vegetation treatments in nesting and wintering PHMAs would in turn maintain soil stability and reduce soil erosion, thereby maintaining the water quality of streams and water bodies in a larger area, compared to Alternative A.

Using the *WGFD Protocols for Treating Sagebrush to Benefit Sage-Grouse* for vegetation treatments in PHMAs would result in impacts to watershed resources and water quality similar to Alternative B, except the effects, except the effects would be more intense as treatment proposals would be subject to these additional protocols.

Reclamation of surface disturbances in sage-grouse habitats in accordance with the standard *Wyoming Reclamation Policy* (BLM 2009a), along with development of a monitoring plan for each reclamation project, would have the same impacts to watershed resources and water quality as discussed under Alternative A. Identifying areas that could be identified for vegetation restoration could be both inside and outside PHMAs, and would have the same impacts to watershed resources and water quality as Alternative A, but would comprise a larger area.

Restoration of burned areas within PHMAs would further enhance watershed resources and water quality, compared to Alternative A, because the restoration would occur within PHMAs throughout the entire planning area.

Avoiding the use of prescribed fire in PHMAs, and complying with *WGFD Protocols for Treating Sagebrush to Benefit Sage-Grouse* and Appendix A to avoid being considered a PHMA disturbance, would have impacts to watershed resources and water quality similar to Alternative A, but not as extensive as these requirements would likely result in less prescribed fire and subsequent vegetation loss, soil erosion, and excess overland flow within PHMAs.

Ensuring long-term persistence of native plants, including sagebrush within PHMAs, would have similar effects to watershed resources and water quality as those discussed under Alternative B, but to a greater

extent, as it would include a larger area within the planning area, and soil erosion would be specifically controlled.

Impacts to watershed resources and water quality from managing the density of surface disturbing activities to not exceed an average of one oil and gas or mining activity location per 640 acres (within PHMAs (core only)) and 5% loss of sagebrush habitat within PHMAs would have impacts to watershed resources and water quality similar to Alternative B, but to a slightly greater extent as surface disturbance could occur within 5% of PHMAs (core only), compared to 3% in Alternative B.

Prohibiting surface occupancy and disturbance activities around sage-grouse leks inside and outside PHMAs would increase protections to watershed resources and water quality, compared to Alternative A. Surface disturbing activities and surface occupancy would be prohibited within 0.6 miles of occupied sage-grouse leks inside PHMAs and within 0.25 miles of occupied sage-grouse leks outside PHMAs (Map 2-3). Primary and secondary (BLM route category) or Route Category level 4 and 5 (Forest Service) road construction within 1.9 miles of the perimeter of occupied sage-grouse leks would also be avoided. Under this Alternative, 337,860 acres would be prohibited, and 160,630 acres would be restricted from surface disturbance and surface occupancy. This increased area of prohibitions around the sage-grouse leks would decrease the amount of surface disturbance and subsequent vegetative removal, soil erosion, runoff, and excess nutrient loading, relative to Alternative A, in which surface disturbance would be prohibited on 68,550 acres and avoided on 93,580 acres. The exception would be the Bates Hole and Fish Creek/Willow Creek areas within the Casper Field Office and the MBNF, where the four-mile and two-mile surface disturbance buffer around occupied sage-grouse leks (respectively) would be reduced to a 0.6-mile prohibition. Also, the restrictions on new primary and secondary or Route Category level 4 and 5 road construction may result in increased road construction outside of the prohibited areas, as longer roads may be constructed to circumvent the lek buffers, and stream crossing could increase, which could cause increased surface disturbance and subsequent soil erosion runoff, and sediment, salt, and excess nutrient loading to water bodies, but not to the extent as Alternative A.

Applying seasonal prohibitions of surface disturbing and/or disruptive activities within sage-grouse nesting/early brood-rearing habitat inside and outside PHMAs, along with winter concentration areas, would increase protections to watershed resources and water quality, compared to Alternative A, as surface disturbance would be entirely eliminated in these areas for a longer time period.

4.19 WILD HORSES

This section presents potential impacts on wild horses from implementing management actions presented in Chapter 2. Existing conditions concerning wild horses are described in Chapter 3.

4.19.1 Impact Indicators

Indicators of impacts on wild horses are as follows:

- Management actions that lead to a change in oil and gas development, coal and other solid leasable mineral development, and locatable mineral entry activities in areas open to grazing
- Management actions that change the quantity of vegetation production, the structure of the overall plant community, or the forage conditions in areas open to grazing
- Management actions that change the quantity of livestock permitted to graze in areas accessible to wild horses.

4.19.2 Assumptions

The analysis is based on the following assumptions:

- The number of wild horses would increase about 18% annually and be maintained by periodic removals.
- Wild horse removals (gathers) would occur about every three to four years in each HMA.
- Maintenance of wild horse populations at AMLs within existing HMAs would be accomplished through removals and selected application of other population control practices.
- Wild horse gathers would use existing trap locations for the most part. About 30 acres have been disturbed from the development of existing traps.
- Wild horse management would be in compliance with the Wild Free Roaming Horses and Burro Act of 1971.
- Within the planning area, active HMAs are located within the Rawlins and Rock Springs Field Offices (Map 3-25), and approximately 1,488,260 acres of sage-grouse priority habitat areas are located within these HMAs.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.19.3 Alternative A

Requiring that utility structures be placed near existing facilities and limiting the designation of new corridors within sage-grouse core habitat areas (excluding the Newcastle Field Office) would result in increased short-term surface disturbance, including loss of vegetation and forage resources, and an increase in the potential for the introduction and proliferation of noxious weeds. However, these restrictions would concentrate the locations of surface disturbance within designated ROWs in the long-term, which would decrease widespread forage loss. These limitations would also help to control human presence, which would help maintain the free-roaming nature of wild horses.

Under Alternative A, 285,930 acres of sage-grouse core habitat areas would be managed as ROW exclusion areas (Map 2-9), which would prevent surface disturbing activities related to ROW development occurring within the exclusion area, which would prevent forage loss from ROW development in these areas. Under Alternative A, 2,460,340 acres of general sage-grouse habitat would be managed as ROW avoidance areas (Map 2-9), which would reduce surface disturbing activities related to ROW development from occurring within the avoidance areas, which would reduce forage loss from ROW development in these areas.

Allowing wind energy development in sage-grouse core habitat areas, except in areas that would be closed in order to protect sensitive resources, would increase vegetation disturbance and loss of available forage. All sage-grouse priority habitat areas within HMAs would be available for wind energy development activities, except for 424,820 acres within some areas of HMAs that would be closed for the protection of sensitive resources (Map 2-29). Approximately 1,254 2-MW wind turbines are projected to be constructed across the entire planning area. Wind energy development activities involve land-clearing and surface disturbances. These actions could remove and disturb vegetation and result in a short-term loss of forage resources, as well as a decline in the health of vegetative communities, until these areas were stabilized and revegetated. Wind energy development activities could temporarily increase human presence, which would reduce the free-roaming nature of wild horses. Within the areas closed to wind energy development, the amount of land-clearing and surface disturbance associated with the development of new wind turbines would be eliminated, which would in turn reduce the amount of overall vegetation disturbance and forage removal. However, impacts to wild horses would only occur where development occurs within HMAs. It is not known where wind energy development would take place, so the quantification of surface disturbance associated with wind energy development within HMAs is not possible.

Use of forage by livestock and wildlife and surface disturbing activities associated with grazing can reduce the amount and availability of forage and water for wild horses by removing vegetation or causing disturbance. Managing rangelands to meet Standards and Guides would continue to provide forage needed for wild horses, livestock, and wildlife. Livestock and wildlife grazing could result in some site-specific cases of increased competition for, or overuse of, forage and water. The extent of the competition or overuse would vary based on the time between monitoring of findings and adjustments to livestock and wildlife grazing use or wild horse populations. Monitoring of grazing use by all grazing animals would reduce these impacts on wild horses by reducing the time between the identification of the problem and the implementation of a solution.

Adjusting grazing practices during times of drought would occur across the Casper Field Office, BTNF, and TBNG. This would reduce flexibility in grazing management (e.g., limiting season of use), which could potentially result in more growing season use, and areas of heavy and severe use, leading to loss of perennial vegetative cover and increased soil erosion. This could lead to short-term and long-term decreased habitat conditions for wild horses.

Structural range improvements (including but not limited to: cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks, windmills, etc.) would potentially alter grazing management practices and increase surface disturbing activities in the short-term. Construction of range improvements would serve to improve livestock distribution and allow livestock to utilize more of the rangeland, which could consequently lead to short-term and long-term decreased habitat conditions for wild horses. Prohibiting the placement of salt, mineral, or forage supplements within 500 feet in the Rock Springs Field Office (and within 0.25 miles in the Casper, Kemmerer, and Pinedale Field Offices, and MBNF) to two miles in the TBNG, from water, wetlands, and riparian areas would draw wild horses away from sensitive riparian areas and result in maintaining or improving riparian conditions and water quality, which would enhance forage conditions and provide water sources for wild horses. Controlling surface occupancy on fragile soils would reduce vegetation removal and help to conserve available forage in these

areas. Projects designed to enhance watershed health would enhance vegetation resources by reducing erosion and improving water quality, thereby increasing forage levels for wild horses.

Allowing fluid mineral leasing in sage-grouse core habitat areas throughout the planning area, except in unavailable areas (Map 2-4) would result in increased forage loss and decreased vegetative health. Approximately 871,780 acres would be closed to oil and gas leasing, 40,980 acres would be managed as NSO areas, and 5,015,210 acres would be managed as CSU areas. Under this alternative, 13,653 BLM/Forest Service oil and gas wells and 2,758 CBNG wells would be anticipated in sage-grouse core habitat through 2020, resulting in 130,330 acres that would be disturbed over the short-term (before reclamation), and 39,050 acres that would be disturbed over the long-term (after reclamation). Oil and gas development activities would involve land-clearing and surface disturbances, such as the construction of well pads, roads, and pipelines in sage-grouse core habitat areas. These actions remove and disturb vegetation and increase the potential for the introduction and proliferation of noxious weeds, subsequently decreasing the overall health of available forage both in the short term during construction activities, and long term, as permanent structures, such as well pads, pits, and roads are maintained. Also, fluid mineral development activities could increase the potential for harassment and loss from vehicle collisions. Not applying minimum lease sizes within sage-grouse core habitat areas under this alternative may result in a greater number of smaller leases within these areas. A greater number of leases could result in temporary displacement and decrease of free-roaming areas for wild horses.

Allowing for solid leasable mineral leasing within sage-grouse core habitat areas, except areas that are unavailable (261,000 acres), would result in land-clearing and surface disturbances from mineral extraction and excavation, associated road construction, and construction of surface mining facilities, which remove and disturb vegetation and result in subsequent short-term and long-term loss of forage available for grazing. The magnitude of long-term vegetation removal and reduction in available forage from mining activities and mineral exploration would depend on the duration of activity, as well as the type of reclamation efforts implemented and how long it would take for disturbed areas to become stabilized and vegetated. These activities would also increase human presence which would reduce the free-roaming nature of wild horses.

Withdrawing portions of core habitat areas (1,892,620 acres) from locatable mineral entry (Map 2-19) would decrease the amount of surface disturbing activities associated with mineral entry, thereby maintaining vegetation for wild horses.

Mineral material exploration, sales, and free use permit operations in sage-grouse core habitat areas (except areas that are unavailable) would also lead to surface disturbances that would result in short-term and long-term loss of forage (Map 2-14). There would be 472,800 acres of sage-grouse core habitat areas closed to mineral material exploration, sales, and free use permits.

Managing the Poison Spider OHV Park, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area, and within the Casper, Kemmerer, Rawlins, and Rock Springs Field Offices, respectively, as OHV “open” areas would result in short-term and long-term impacts to vegetation and forage conditions. The entire Greater Sand Dunes Recreation Area within the Rock Springs Field Office includes an area overlapping an HMA, but impacts would occur to wild horses if the area managed as “open” is located within that HMA. A one-time disturbance resulting from OHV use could cause physical damage to vegetation by breaking stems and branches. Usually, with a one-time disturbance, plants and disturbed areas would recover. However, with repeated use, soil compaction occurs and new trails would be established, resulting in long-term loss of vegetation and forage available for grazing, if these activities occur within HMAs. These activities could also increase human presence which would reduce the free-roaming nature of wild horses and could result in temporary displacement of the horses.

Vegetation management actions designed to enhance vegetation production, age class, structural diversity, and plant community vigor would benefit wild horses by increasing forage availability. Applying vegetation treatment measures in the TBNG Planning Unit where shrub canopy cover of sagebrush is less than 15%, and in areas less than 80 acres and no more than 20% of the sagebrush stands in wintering habitat for TBNG, would increase the overall health and function of vegetation communities. Application of these measures could result in short-term vegetation loss and subsequent grazing impacts during treatment activities, but would improve vegetation health and available forage for wild horses over the long-term. Additionally, vegetation treatment areas within the Pinedale and Rock Springs/Green River Field Offices would be rested from livestock grazing for a minimum of two full growing seasons after treatment, and one full year prior to treatment in the Rock Springs/JMH Field Office. Protecting vegetation treatments from livestock forage consumption in the short-term following the treatment, would increase the grass available in these areas, which could increase the quantity and quality of forage available for wild horses.

Water developments to improve herd distribution and manage forage utilization would enhance vegetation resources by better distributing the resource across the range, thus better distributing the herd and increasing available forage levels.

Wildfires and prescribed fires would displace wild horses and cause a short-term reduction in available forage. Suppressing wildfires would help maintain vegetation cover and conserve forage in the short-term. Suppression activities, such as fire lines and staging areas, would result in surface disturbance and short-term losses in forage. Vegetation in areas of continued fire suppression would convert to late seral vegetation, decreasing grass production in the long-term. In addition, continued long-term suppression could increase the potential for larger, more intense fires, and a substantial loss of forage.

Prescribed fire would be used in areas having greater than 10-inch precipitation zones to reduce or rejuvenate shrub cover and increase the herbaceous forage available for grazing animals. Over the long-term, this action would increase management flexibility and improve grazing distribution. Prescribed fire would result in the short-term deferment of grazing to allow for vegetation recovery. However, for a period of time after a fire, enhanced forage availability and production would be realized as herbaceous vegetation would temporarily replace woody shrub species.

Within HMAs, prohibiting surface disturbing activities (which could include the construction of new roads) within 0.25 miles of occupied sage-grouse leks within the Pinedale Field Office, Rawlins Field Office, and the Jack Morrow Hills planning area within the Rock Springs Field Office (68,550 acres) and restricting surface disturbing activities within 0.25 miles of occupied sage-grouse leks within the Casper Field Office (and within 4 miles of sage-grouse leks within the Bates Hole and Fish Creek/Willow Creek areas), and the Kemmerer, Newcastle, and Rock Springs Field Offices (93,580 acres) would reduce the amount of surface disturbing activities resulting from newly permitted activities, such as blading and grading, and therefore reduce the amount of vegetation removal and forage loss. However, these avoidances may result in increased road construction outside of the avoided areas, as longer roads may be constructed to circumvent the lek buffers, which could cause increased surface disturbance and subsequent vegetation removal and loss of forage in these areas.

Prohibiting the construction of new oil and gas facilities within 0.25 miles of active sage-grouse display grounds within the TBNG and MBNF (from March 1 through June 30), and permitting short-term disturbances to improve habitat within two miles of sage-grouse breeding habitat would decrease the amount of surface disturbance occurring over the four month season. Disturbances occurring to improve habitat would remove vegetation and decrease forage levels over the short-term. However, over the long-term the improvements would enhance vegetative conditions and likely increase forage production.

4.19.4 Alternative B

No new transmission corridors or above-ground transmission structures would be authorized within sage-grouse priority and connectivity habitat areas throughout the planning area, both inside and outside existing corridors. Vegetation and forage within sage-grouse priority habitat areas would not be impacted, as resulting surface disturbances from utility corridor development would not occur.

Wind energy development activities would be prohibited within sage-grouse priority habitat (5,033,240 acres). This would result in less development inside sage-grouse priority habitat areas, which would decrease surface disturbance in the short-term and long-term, relative to Alternative A. These restrictions would reduce the amount of vegetation removal and forage loss associated with wind energy development activities, compared to Alternative A, in which only 424,820 acres are closed from development. Approximately 127 2-MW wind turbines are projected to be constructed through 2020 across the entire planning area, which would be 90% fewer turbines than Alternative A. However, impacts to wild horses would only occur where such development occurs within HMAs. It is not known where such development would take place, so the quantification of surface disturbance within HMAs is not possible.

Allotments managed by the BLM not meeting the Wyoming Standards for Healthy Rangelands within all sage-grouse priority habitat would require a 20-30% forage allocation reduction for livestock under this alternative compared to Alternative A. This requirement would reduce competition for vegetative resources between livestock and wild horses compared to Alternative A. Retiring specific livestock allotments and/or permits could occur under this alternative as well, which would also increase available forage for wild horses compared to Alternative A. However, post-drought vegetation recovery management would occur within all priority sage-grouse habitat areas, which would further reduce grazing management flexibility compared to Alternative A, and thus potentially lead to both short- and long-term decreased habitat conditions for wild horses.

Impacts associated with new structural range improvements, such as cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks, windmills, etc., would be the same as those described in Alternative A, except they would only occur across all priority sage-grouse habitat and thereby reduce the extent of associated impacts, as structural range improvements are more restricted under Alternative B.

Under this alternative, additional water developments would only be authorized when priority sage-grouse habitat would be conserved, enhanced, or restored to sage-grouse, thus fewer impacts to wild horses could be realized, if there are fewer range improvements permitted. Water developments are used and needed for livestock, so limiting their development would help to improve the ecological health of the landscape and thereby improve vegetative/forage conditions, but would also limit the ability to provide water for livestock and distribute livestock across allotments.

Priority sage-grouse habitat areas would be closed to oil and gas leasing, unless there is an opportunity for the BLM and Forest Service to influence conservation measures where surface and/or mineral ownership is not entirely federally owned (Map 2-5). 6,886,890 acres would be closed to oil and gas leasing and 2,117,160 acres would be managed as NSO areas. Under this alternative, 11,555 BLM/Forest Service oil and gas wells and 2,154 CBNG wells would be anticipated in sage-grouse priority habitat areas through 2020, resulting in 104,050 acres that would experience short-term disturbance, and 33,530 acres that would be disturbed over the long-term. The number of wells anticipated would be 16% less than Alternative A. This would reduce the amount of vegetation removal and loss of available forage for wild horses, compared to Alternative A. Not applying minimum lease sizes within sage-grouse priority habitat areas would have the same impacts to wild horses as Alternative A. Under Alternative B, oil and gas leasing would be prohibited within priority habitat (with the exception that if the lease is entirely within priority habitat, a

four-mile NSO would be applied around the lek), which would maintain vegetation for wild horses because no new vegetative disturbances would occur as a result of oil and gas development on new leases.

Proposing withdrawal from locatable mineral entry (5,118,070 acres) based on risk to the sage-grouse and its habitat from conflicting locatable mineral potential and development would reduce the impacts to wild horses, compared to Alternative A.

Vegetation removal and loss of forage availability from non-energy, solid leasable mineral development would be reduced, relative to Alternative A (Map 2-25). Approximately 6,992,690 acres would be closed to solid mineral development compared to 261,000 acres closed in Alternative A. New coal leases and coal exploration licenses within sage-grouse priority habitat areas would be prohibited, and additional screening processes would be implemented outside sage-grouse priority habitat areas. No new leases for other solid leasables or mineral exploration by prospecting permits or licenses would be allowed inside sage-grouse priority habitat areas, and mineral material exploration, sales, and free use permits would also be closed in sage-grouse priority habitat areas, subject to valid existing rights (Map 2-15). A reduction in these operations would reduce the amount of associated surface disturbance, and subsequently reduce the amount of vegetation removal and loss of forage availability.

All sage-grouse priority habitat areas (6,992,690 acres) would be closed to mineral material exploration, sales, and free use permits, compared to 472,800 acres closed in Alternative A(Map 2-15). Reclamation of mineral pits no longer in use would return the grazing lands to the production levels found prior to development.

Managing the OHV use in the Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation Area as “open” would result in surface disturbance and forage loss similar to Alternative A if this disturbance was located within an HMA, except the non-sand dune portions of these areas would be managed as “limited to designated roads and trails.” Because recreational OHV users would remain on designated roads within these areas, vegetation would return, and forage would increase in the long-term.

Prohibiting new road construction within all priority sage-grouse habitat (5,000,400 acres), unless valid existing rights cannot be accessed via existing roads, would further reduce the amount of surface disturbing activities associated with road development compared to Alternative A, in which surface disturbing activities are prohibited within 68,550 acres and restricted within 93,580 acres. The restoration of roads and trails would include reseeding and transplanting sagebrush, which over the long-term could increase available forage for wild horses.

Impacts to wild horses from not reducing sagebrush shrub canopy cover to less than 15% and resting all vegetation treatment areas for two full growing seasons, except for the offices that don’t rest vegetation treatments (the only offices that rest are the ones mentioned in Alternative A), would be similar to Alternative A, except they would occur within all priority sage-grouse habitat.

Impacts associated with wild horse management activities would be the same as Alternative A, but with additional management considerations for sage-grouse habitat. Consideration of additional management goals specific to achieving sage-grouse habitat objectives could potentially cause short- and long-term impacts to wild horses if these considerations were to ever restrict wild horses from grazing in sage-grouse priority habitat, thereby increasing the extent of the impacts.

The long-term enhancements in forage availability and production produced by wildland fire would have similar impacts to wild horses as Alternative A, but would be realized over more acres. Post fuels management projects would be designed to ensure long-term persistence of seeded or pre-treatment native

plants which could cause temporary or long-term changes in grazing management. Prescribed fire would be used in areas having greater (>12 inches) precipitation zones compared to Alternative A, in which a 10-inch or greater precipitation zone is required.

Managing the existing levels of density of disturbance on the landscape within sage-grouse priority habitat and connectivity habitat areas would increase protection to forage levels within these areas over the long-term. Density of disturbance on the landscape would not cover more than 3% of the total sage-grouse priority habitat regardless of ownership (and would not exceed 3% habitat disturbance per 640 acres inside sage-grouse connectivity areas). In priority habitat where the 3% disturbance threshold is already realized, no further disturbances would be permitted and an additional designation would ensure that no more than 3% of the total priority habitat is disturbed within 10 years. These limits would reduce the amount of surface disturbance in these areas, which would reduce vegetation removal, and subsequently maintain the overall health and function of forage. These limitations would also limit human presence, which would maintain the free-roaming nature of wild horses, compared to Alternative A in which surface occupancy and disturbance activities would be prohibited on 68,550 acres and restricted on 93,580 acres, with no threshold values.

4.19.5 Alternative C

Under Alternative C, 11,556,490 acres of priority and general sage-grouse habitat areas would be managed as ROW exclusion areas, which would provide additional forage areas for wild horses compared to Alternative A. Site reclamation to restore the habitat would be the same as the impacts described in Alternative B.

Wind energy development activities (including industrial solar projects) would not be allowed both inside and within five miles of sage-grouse priority habitat areas. This would result in less development inside sage-grouse priority habitat areas, which would decrease surface disturbance in the short-term and long-term, relative to Alternative A, in which only 424,820 acres are closed from development. Approximately 127 2-MW wind turbines are projected to be constructed across the entire planning area, which would be 90% fewer turbines than under Alternative A. These restrictions would reduce the amount of vegetation removal and forage loss associated with wind energy development activities, compared to Alternative A. However, impacts to wild horses would only occur where such development occurs within HMAs. It is not known where such development would take place, so the quantification of surface disturbance within HMAs is not possible.

Livestock grazing would be entirely prohibited within sage-grouse priority habitat compared to Alternative A, in which only the allotments managed by the BLM not meeting the Wyoming Standards for Healthy Rangelands would be prohibited from livestock grazing. Reseeding with native species could maintain overall structure and resiliency of vegetation health and thereby improve or increase long-term forage for wild horses. These impacts would not be realized under any of the other alternatives. Impacts associated with management decisions to retire specific allotments and/or permits, and post-drought management would have similar impacts as Alternative B.

All new structural range improvements, such as cattle guards, fences, exclosures, corrals or other livestock handling structures, pipelines, troughs, storage tanks, windmills, etc., would be avoided in sage-grouse priority and general habitat unless beneficial to the species, thus potentially reducing the amount of surface disturbing activities that would occur and resulting impacts to wild horses in the short-term compared to Alternative A. Prohibiting new water developments under this alternative would decrease surface disturbing activities associated with development, thus maintaining current available forage for wild horses in the short-term. However, enhancements to riparian vegetation and water quality, which would provide forage

and water sources for wild horses, would not be realized over the long-term. These impacts would only be realized in general habitat as priority habitat is prohibited from livestock grazing.

Closing priority and general sage-grouse habitat areas to fluid mineral leasing, which will prevent the construction of new oil and gas wells, unless there is an opportunity for the BLM or Forest Service to influence conservation measures where surface and/or mineral ownership is not entirely federally owned, would reduce the amount of vegetation removal and loss of available forage for wild horses, compared to Alternative A (Map 2-6). 16,878,220 acres would be closed to oil and gas leasing and 2,117,160 acres would be managed as NSO areas. Under Alternative C, 9,533 BLM/Forest Service oil and gas wells and 1,594 CBNG wells would be anticipated in sage-grouse priority habitat areas through 2020 resulting in 85,140 acres that would experience short-term disturbance, and 27,030 acres that would be disturbed over the long term. The number of wells anticipated would be 32% less than Alternative A, thus reducing the amount of vegetation removal and loss of available forage for grazing compared to Alternative A. Under Alternative C, agencies would explore options to amend, cancel, or buy out leases in ACECs and sage-grouse priority and general habitat, which would reduce oil and gas drilling and thus reduce forage loss for wildlife.

Proposing withdrawal from locatable mineral entry (5,118,070 acres) based on risk to the sage-grouse and its habitat from conflicting locatable mineral potential and development (Map 2-21) would result in the same impacts to wild horses as discussed in Alternative B.

Impacts to wild horses from coal and other solid leasable mineral development, as well as non-energy leasable mineral leasing, mineral material exploration, sales, and free use permits would all be the same as those described under Alternative B.

The use of OHVs in the Casper, Rawlins, and Rock Springs Field Offices would result in the same impacts to wild horses as Alternative B.

Prohibiting new road construction within four miles of active sage-grouse leks, and avoiding new road construction in sage-grouse priority and general habitat would reduce impacts to wild horses compared to Alternative A, in which prohibitions occur within 0.25 miles of occupied sage-grouse leks within specific parts of the planning area. A larger buffer zone around sage-grouse leks under this alternative would reduce the amount of surface disturbing activities from new road construction and therefore reduce the amount of vegetation removal and forage loss compared to Alternative A. Route construction would be limited to realignments of existing routes and mitigating efforts would be required if these efforts had impacts, thus reducing additional surface disturbing activities compared to Alternative A. Impacts associated with restoring roads and trails would be similar to those described in Alternative B.

Impacts to wild horses from not reducing sagebrush shrub canopy cover to less than 15% would be similar to Alternative A, except they would occur within all priority and general sage-grouse habitat, thereby increasing the extent of the impacts. Under this alternative, vegetation treatment plans would establish non-grazing exclosures, thus potentially resulting in site-specific cases of increased competition between livestock and wildlife for forage and water compared to Alternative A. Vegetation community and production recovery in treated areas would be enhanced, increasing the post-treatment grazing capacity of treated lands in the long-term.

Impacts associated with wild horse management activities would be the same as Alternative B.

Impacts resulting from fire and fuels management would be similar to those under Alternative B, except realized over more acres and with a greater emphasis on ensuring long-term persistence of sagebrush. Lands would be managed to be in similarity to potential natural community, enabling a long-term balance of

herbaceous and woody vegetation, thereby providing a stable forage source for wild horses. Post fire recovery efforts could exclude wild horses until burned areas are fully recovered. This could temporarily displace wild horses in the short-term, but could provide enhanced forage availability for wild horses in the long-term.

Impacts to wild horses from managing the density of disturbance on the landscape inside sage-grouse connectivity areas would be the same as those described under Alternative B.

Surface occupancy and disturbance activity prohibitions around sage-grouse leks inside sage-grouse priority habitat areas would be the same as those described under Alternative B. All of the impacts described under Alternative A would not be realized for activities related to oil and gas activities.

4.19.6 Alternative D

Allowing new transmission projects in existing utility corridors within a designated two-mile wide corridor through sage-grouse core and connectivity habitat areas and within 0.5 miles either side of existing 115 kV or larger transmission lines, between July 1 and March 14 (or between July 1 and November 30 in winter concentration areas) (Map 2-12), would exclude a larger area from surface disturbing activities (5,230,110 acres), relative to Alternative A, in which 285,930 acres would be excluded. This could result in decreased vegetation removal and loss of forage for wild horses, as well as an increase in human presence, compared to Alternative A. However, 1,300,510 acres of general sage-grouse habitat areas would be managed as avoidance areas for new ROWs, compared to 2,460,340 acres avoided in Alternative A, which could potentially increase the amount of surface disturbing activities and resulting forage loss that could occur compared to Alternative A.

Wind energy development activities would be excluded within portions of sage-grouse core habitat areas, (424,820 acres) and avoided within the remainder of these habitat areas (4,608,420 acres) (Map 2-32). These restrictions would reduce the amount of surface disturbance, vegetation removal, and loss of available forage associated with wind energy development activities, compared to Alternative A, in which only 2,438,850 acres would be avoided. Approximately 980 2-MW wind turbines are projected to be constructed through 2020 across the entire planning area, which would be 22% fewer turbines than under Alternative A. However, impacts to wild horses would only occur where such development occurs within HMAs. It is not known where such development would take place, so the quantification of surface disturbance within HMAs is not possible.

Impacts to wild horses from livestock grazing management would be the same as those described under Alternative A, with the exception that the flexibility in grazing management would be further reduced, thus impacting short- and long-term habitat conditions for wild horses compared to Alternative A. Post-drought management impacts would be similar to Alternative A.

Impacts associated with structural range improvements, such as cattle guards, fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks, windmills, etc., would be similar to Alternative A, except modifications would be made to existing range improvements. No new structural range improvements would occur under this alternative, which would decrease surface disturbing activities in the short-term. Authorizing water developments as needed within sage-grouse core and connectivity habitats would further increase vegetative resources available for wild horses compared to Alternative A.

Approximately 964,860 acres in sage-grouse core and connectivity habitat areas would be closed to oil and gas leasing, and 2,117,990 acres would be managed with CSU stipulations (Map 2-7). Under Alternative D, 13,083 BLM/Forest Service oil and gas wells and 2,686 CBNG wells would be anticipated in sage-grouse priority habitat areas through 2020, resulting in 44,050 acres that would experience short-term disturbance,

and 9,160 acres that would be disturbed over the long-term. The number of wells anticipated would be 4% less than Alternative A. Not applying minimum lease sizes within sage-grouse core and connectivity habitat areas would have the same impacts to wild horses as under Alternative A.

Withdrawing core and connectivity habitat areas from locatable mineral entry (1,892,620 acres) (Map 2-22), opening sage-grouse core and connectivity habitat areas to mineral material exploration, sales, and free use permits (Map 2-17), and continuing to have salable mineral pits not in use available for other uses would all result in the same impacts to wild horses as discussed under Alternative A.

Impacts to wild horses from coal and other solid leasable mineral development, as well as non-energy leasable mineral leasing, would be the same as those described under Alternative A, except impacts would also occur in the areas that were previously unavailable for leasing. Thus, an increase in surface disturbing activities and subsequent forage loss would occur. These activities would also increase human presence which would reduce the free-roaming nature of wild horses.

The use of OHVs in the Poison Spider OHV Park, part of the hill climb area in Section 33, Dune Pond Cooperative Management Area, and a portion of the Greater Sand Dunes Recreation area would result in the same impacts to wild horses as Alternative A if the surface disturbance was located within an HMA.

Avoiding new road construction within 0.25 miles of occupied sage-grouse leks within all sage-grouse core and connectivity habitat areas would reduce impacts to wild horses compared to Alternative A, in which prohibitions only occur within 0.25 miles of occupied sage-grouse leks within specific parts of the planning area. The 0.25-mile restriction within all sage-grouse core and connectivity habitat areas (an additional 129,510 total acres) would result in less surface disturbance and subsequent forage loss.

Treated areas would not be rested from grazing under this alternative, thus an increase in the quantity and quality of forage available for wild horses would not be realized compared to Alternative A. Vegetation community and production recovery in treated areas would be poor, thus potentially decreasing the post-treatment grazing capacity of treated lands in the long-term.

Impacts associated with wild horse management activities would be similar to those described in Alternative B.

The effects on wild horses resulting from fire management actions would be the same as those described under Alternative A.

Managing the density of energy production (excluding coal mining) and/or transmission structures (excluding buried pipelines or power lines) on the landscape inside sage-grouse core habitat would increase forage loss and human presences within the planning area long-term, compared to Alternative B. A limit of three energy production locations and/or transmission structures per 640 acres within the project impact analysis area could occur, and an additional 9% of total sagebrush habitat loss would be allowed under this alternative, compared to the 3% total permitted in Alternative B.

4.19.7 Proposed Land Use Plan Amendments

Restricting utility structures within PHMAs would result in impacts to wild horses similar to Alternative A, except new transmission projects proposed outside of corridors would only be considered where it can be proven that sage-grouse populations could be avoided through project design and/or mitigation. Surface occupancy and surface disturbing activities for agriculture would be prohibited from March 15 to June 30, and on or within a 0.6-mile radius of the perimeter of occupied sage-grouse leks. Surface disturbance,

vegetation removal, and forage loss would likely decrease further, relative to Alternative A, due to these requirements.

Wind energy development activities would be excluded within portions of PHMAs (core only) (425,080 acres) and avoided within the remainder of these habitat areas (4,731,350 acres) (Map 2-33). This would reduce the level of development within sage-grouse habitat areas, resulting in fewer surface disturbances and subsequent forage loss compared to Alternative A, in which only 2,438,850 acres would be avoided. Approximately 127 2-MW wind turbines are projected to be constructed through 2020 across the entire planning area, which would be 90% fewer turbines than under Alternative A.

Impacts to wild horses from livestock grazing management would be similar to the impacts described in Alternative A.

Continuing to modify, when necessary, existing range improvements (e.g., fences, watering facilities) for impacts on sage-grouse and its habitat within PHMAs and GHMAs would have reduced impacts to wild horses compared to Alternative A. Continuing to authorize supplements and supplemental feeding where appropriate would result in impacts to wild horses as discussed under Alternative A.

Impacts to wild horses from fluid mineral leasing in PHMAs would be similar to those described in Alternative A, except fewer wells are anticipated. Approximately 883,670 acres would be closed to oil and gas leasing, 441,690 acres would be managed as NSO areas, and 6,438,480 acres would be managed as CSU areas. Under this alternative, 12,355 BLM/Forest Service oil and gas wells and 2,462 CBNG wells would be anticipated in PHMAs through 2020, resulting in 37,380 acres that would experience short-term disturbance, and 8,290 acres that would be disturbed over the long-term. The number of wells anticipated would be 10% less than Alternative A, which would reduce the amount of vegetation removal and loss of forage available for wild horses. Application of a minimum lease size of 640 acres within PHMAs on BLM lands would help to prevent fragmentation and increased numbers of smaller-sized leases by reducing the potential for increased surface disturbance and subsequent forage loss, relative to Alternative A. There are exceptions for leases smaller than 640 acres, such as for regulatory compliance, but these exceptions would likely not be numerous enough to outweigh the reduction in vegetation removal and forage loss from minimum lease sizes.

Proposed withdrawals and consideration of proposed withdrawals of areas within PHMAs from locatable mineral entry on BLM-administered lands (1,146,130 acres; Map 2-23) would reduce the impacts to wild horses, compared to Alternative A.

Impacts to wild horses from coal operations would be similar to Alternative A, except operations in PHMAs (except in unavailable areas) would implement measures where possible to protect habitat, which would decrease vegetative disturbance and loss of forage from associated surface disturbances (Map 2-28). Exploration licenses and on-lease would not be considered until after NEPA analysis. These procedures may reduce vegetation removal and subsequent forage loss, if the analyses and potential mitigation measures result in revegetation and soil stabilization.

Impacts to wild horses from solid leasable mineral operations could be less than Alternative A (Map 2-28). Short-term disturbance to vegetation from solid leasable mineral operations would still occur inside PHMAs (except in unavailable areas), but if revegetation efforts from mitigating measures were successful, long-term forage loss would be reduced. Human presence could also be reduced, which would increase the free-roaming nature of wild horses.

Impacts associated with mineral material exploration, sales, and free use permits would be the same as described in Alternative A, except in PHMAs where restrictions to surface disturbance and disruptive

activity may result in less surface disturbance, vegetation removal, and subsequent forage loss inside these areas (Map 2-18). However, these operations may be sited outside of PHMAs, in which case the impacts to wild horses would be the same as Alternative A. Managing the OHV use as "open" would result in surface disturbance and forage loss would be similar to Alternative A, except the non-sand dune portions of Dune Pond Cooperative Management Area and a portion of the Greater Sand Dunes Recreation Area would be managed as "limited to existing roads and trails." If recreational riders remain on existing roads and trails, vegetation would return off-trail, and forage availability would increase. However, if recreational riders did not follow these designations, vegetation removal and forage loss would be equal to Alternative A.

Avoiding primary and secondary road construction within 1.9 miles of the perimeter of occupied sage-grouse leks and prohibiting construction of all other roads within 0.6 miles of sage-grouse leks within PHMAs would reduce the amount of surface disturbance associated with these activities compared to Alternative A. Alternatively, these restrictions could potentially lengthen roads to avoid leks which would increase surface disturbing activities, increasing vegetation removal and the loss of forage where lengthened. Total surface disturbing activities would not exceed 5% within PHMAs under this alternative. These restrictions would lessen the amount of surface disturbance and resulting vegetation removal and forage loss, but not to the same extent as Alternative B or C.

Impacts associated with wild horse management activities would be the same as Alternative B.

Management actions associated with the fire management program would include suppressing fire in areas where fire is not desired. This management action would provide supportive analysis in determining the highest priority areas in which full suppression will be used in order to limit fire growth. Compared to Alternative A, this management action would likely reduce the use of fire suppression, which could increase both short-term forage loss and long-term forage increases. In addition, there could be a decrease in forage loss as a result of suppression activities. In the long term, allowing fire in desired areas could increase vegetation cover and diversity, improving forage for wild horses. Vegetation treatments to increase forage availability would also increase the amount of forage for wild horses compared to Alternative A.

Managing the density of disturbance on the landscape inside PHMAs would increase impacts to wild horses within the planning area long-term, compared to Alternative B. A limit of one oil and gas or mining activity locations per 640 acres in PHMAs (core only) within the project impact analysis area could occur, and a 5% loss of sagebrush habitat would be allowed under this alternative, compared to the 3% total permitted in Alternative B. These limits would reduce the amount of surface disturbance in these areas, which would reduce vegetation disturbance and removal, and subsequently maintain the overall health and function of forage available for wild horses compared to Alternative B.

Restricting surface occupancy and disturbance would result in impacts similar to Alternative A, except the restrictions would cover a greater area. Surface disturbing activities and surface occupancy would be prohibited within 0.6 miles of occupied sage-grouse leks inside PHMAs, and within 0.25 miles of occupied sage-grouse leks outside PHMAs (Map 2-3). Under the Proposed LUP Amendments, 337,860 acres would be prohibited from surface occupancy and disturbance, compared to 68,550 acres in Alternative A, an increase of 393%. These restrictions would decrease the amount of surface disturbance and subsequent vegetation removal and forage loss, relative to Alternative A.

4.20 WILDLAND FIRE AND FUELS

This section presents potential impacts on fire and fuels management from implementing management actions presented in Chapter 2. Existing conditions concerning fire and fuels management are described in Chapter 3.

4.20.1 Impact Indicators

Indictors of impacts on wildland fire management are as follows:

- A change in the likelihood of human-caused wildfires
- Changes to the composition of vegetation communities that affect wildland fire size, intensity, and frequency
- Alteration of vegetative cover that results in a shift in fire regime condition class (FRCC)
- Management actions that inhibit a response to wildland fire or appropriate treatments to prevent wildland fire.

4.20.2 Assumptions

The analysis was based on the following assumptions:

- A direct relationship exists between density of human use within the planning area and the frequency of human-caused fires.
- A direct relationship exists between fuel loads (standing and non-standing vegetation) and potential fire size and intensity.
- Proper application of prescribed fire (as well as mechanical, chemical, and biological treatments) can reduce the fire hazards presented by an accumulation of fuel. The application of prescribed fire and the effects of prescribed fire on resource values will be considered in this section.
- Projected levels of fuels and restoration treatments are to be identified.
- WUI funding will be more stable than non-WUI funding.
- National direction will continue to focus on cost containment for large fire activities and emphasize response to wildland fire.
- RMP efforts should identify assumed levels of fuels treatment (to be used as the basis for the impact analysis).
- Fire management budgets will be cyclical.
- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.20.3 Alternative A

ROW infrastructure such as power lines, transmission towers, and communication towers could increase the potential for ignition sources and probability of wildland fire occurrence through human presence on roads, corridors, and during development or maintenance of ROW infrastructure. Excluding and avoiding ROWs on 285,930 and 2,460,340 acres, respectively, could reduce human presence and ignition sources such as vehicles and machinery that could cause wildland fires. ROW development and associated corridors could increase accessibility for fire suppression equipment and aid in fire containment as access roads and other areas cleared for development create fire breaks.

Wildfire frequency could decrease in areas where wind energy development is prohibited (424,820 acres) or restricted (2,438,850 acres) by reducing surface disturbing activities and ignition source potential. The proliferation of invasive vegetation species could increase in areas disturbed by wind energy development activities, which would increase the potential for large fires. However, fuels may be reduced and fire breaks may be created during wind energy development, which could reduce fire size and intensity. Fire intensity could be reduced within the projected 1,254 wind energy turbine sites as fuel loads would be removed for construction. However, fire frequency could increase during the development stage as more ignition sources would be available from construction equipment and human presence.

Grazing by livestock, wildlife, and/or wild horses could reduce fine fuels such as grasses that serve as ignition sources and fuel for wildland fires. Grazing can reduce native plant density and open niches for invasive species which would decrease resistance to wildland fires and increase fire frequency. Vegetation health could be improved through applying the Standards for Rangeland Health, which would promote healthy, diverse vegetation communities that generally fuel low-intensity fires and reduce the risk of large, high-intensity fires. This could result in a lower high-intensity fire frequency within the decision area and could encourage the natural fire regime. SDWs could be used to provide emergency relief from fire and drought in the Casper Field Office and TBNG and to help maintain vegetation health and reduce wildfire potential and wildfire frequency. Grazing strategies to improve nesting cover in sagebrush stands within two to three miles of active display grounds in the TBNG could increase the native species composition there by reducing fire frequency, thus maintaining healthier vegetative communities that would be more tolerant to fire. Fire frequency could be reduced by allowing livestock trailing within the Kemmerer Field Office, which could increase grazing along the trail and reduce overall plant biomass and fuel loads within this area. Low intensity fires could be reduced as salt and mineral supplements would be placed at least 500 feet to 0.25 miles away from riparian habitat. The placement would draw grazing concentrations away from these areas and could reduce fine fuels in the grazed areas. Riparian habitat health and resistance to fire could increase as rangeland management and range improvement projects are implemented to improve riparian habitats within the planning area.

Mineral exploration and development could increase fire frequency by increasing the potential for human-caused fire starts and the potential for fire starts from motorized vehicles used during construction. The threat of fire would also increase as surface disturbances could increase fire-prone invasive species establishment/proliferation and habitat fragmentation, thus reducing plant community health. However, mineral exploration and development could reduce the size and intensity of fires through surface disturbing activities that remove vegetation, reduce fuel loads, create fire breaks, and improve access for fire suppression activities. Such impacts would occur on 130,332 acres that would be disturbed by the development of 13,653 oil and gas and 2,758 CBNG wells. These impacts would be reduced or eliminated on 871,780 acres where development is prohibited or limited through stipulations. Fire frequency and intensity could also be reduced in areas that use techniques to minimize surface disturbing activities, such as twinning and directional drilling which could maintain plant community health. Fire potential could be reduced in areas where solid mineral development activities such as vegetation clearing, and associated risks of fire starts from motorized vehicles would be restricted (899,599 acres). Fires could be reduced by

implementing restrictions for new coal leases within the Rock Creek/Tunp and Bear River Divide management areas, and closing numerous areas to solid mineral leasing in Bridger Teton National Forest (261,000 acres). Fire potential could increase as exceptions, waivers, and/or modifications to these management actions could be granted which could increase surface disturbing activities and the potential for human-caused fire starts associated with these activities and associated workers.

Recreational opportunities attract increasing numbers of visitors, which increases the probability for unintentional fires from recreation users and the need for fire suppression activities. Because OHV use allows visitors to access remote areas, human-caused fires such as those from motorized vehicles or unattended campfires could occur in areas that are difficult to access with fire suppression equipment. The routes that provide motorized access to public lands within the decision area could facilitate travel, and increase the distribution of visitors throughout the decision area, thus increasing the extent of related effects. Fire intensity could be reduced in areas of developed campsites which could act as safety zones and fuel breaks, but would also require additional protection in wildland fire events. Developing more recreation sites and facilities would concentrate ignition sources to areas of high use that have reduced vegetation and fuel loads which are less likely to burn. Within the planning area, 4,600 acres would be designated as "open" to OHV use. In designated OHV "open" areas, fire ignition sources from OHV use could occur but risk of human-caused fire starts and risk of fire starts from motorized vehicles would be very low as these OHV "open" areas are dunes which are inherently resistant to fires. The potential for human-caused fire starts would be reduced in the Kemmerer, Rawlins, and Rock Springs field offices and BTNF as potential human-caused ignition sources are decreased by allowing unnecessary/redundant roads/trails to either be reclaimed/rehabilitated and/or closed, thus reducing travel within these areas.

Vegetation and weed treatments would decrease both standing and non-standing vegetation (fuel load) across the decision area, which would decrease the intensity of wildland fires, and allow fires to be more easily controlled. These activities would also modify the composition and structure of vegetation communities by creating mosaic vegetation patterns, natural fuel breaks, and by promoting healthy, diverse vegetation communities that generally fuel low-intensity fires. Specifically, efforts to reduce the incursion of non-native annual grasses (primarily cheatgrass), encroachment of shrubby vegetation, buildup of biomass in forested areas, and spread of noxious and invasive weeds would help to achieve this effect by using weed free seeds (native seed if possible) for rehabilitation. Habitat improvements for sage-grouse could improve vegetation and ecological health and resistance to fires, which would reduce the occurrence of uncharacteristic, large wildland fires, the need for fire suppression, and fire rehabilitation costs.

Using wildland fire and prescribed fire to protect, maintain, and enhance resources would reduce fuel loads and promote healthy, diverse vegetation communities, both of which would decrease the intensity of wildland fires and facilitate fire management efforts. Prescribed fires designed to reduce fuel loads and treat vegetation could occur throughout the planning area. Suppressing wildland fires in areas where fire is not desired such as areas with urban interface, industrial areas, oil and gas sites, high resource values, structures, cultural sites, and habitat for sensitive species, would occur throughout the planning area. Fire suppression may reduce fire size and intensity in these areas and increase the ability to control fires and protect important resources from fire damage. However, consistently maintaining small fires could limit or exclude fire from functioning in its natural role, resulting in further departure from the historic fire regime over the long term. Fire-dependent plant communities could deteriorate over the long-term if fires were prevented from occurring within these communities.

Impacts from Fire Operations on Wildland Fire Ecology and Management Upward Shift in Fire Regime's Condition Class, Reduced Flexibility to Respond to Wildfires_Prioritization of wildland fire responses is based on values at risk and the ability to successfully complete any specific operation. Human life and safety will always take precedence for the wildland firefighting crews to respond to. Other things considered

are improvements that, if damaged or destroyed, would have a great impact on not only the local area but also nationally, and areas that would directly impact human activities.

Greater Sage-Grouse is a value at risk, not unlike municipal watersheds or a watershed that feeds an endangered fish habitat or a culturally significant site. With many equally competing values at risk to wildland fire, an implementation plan must stipulate how to prioritize wildland firefighting crews' efforts. See Appendix J, Greater Sage-Grouse Wildland Fire and Invasive Species Habitat Assessment.

The aerial application of retardant is also a good method for slowing the spread of the fire, but it must be followed up with equipment or crews to completely remove the fuels from the fire's path. These resources come at a financial cost. Transporting heavy equipment, training the operators, maintaining the equipment, and supplying the fuel are all costs associated with the equipment if agency owned. If it is contracted equipment, these are taken in as a factor when calculating the hourly operating cost. The same is taken into account for applying retardant. Both require firefighters to ensure that the fire does not cross the line. The equipment line must be rehabilitated to correct the vegetation damage done during suppression. Holding on to resources to reduce the threat of a fire escaping the control lines is an additional cost. Holding on to crews to mop-up (extinguishing or removing burning material near control lines, felling snags, and trenching logs to prevent rolling after an area is burned, to make a fire safe, or to reduce residual smoke) black next to unburned islands is a cost above what is the normal procedure for cleanup. All of this is a suppression cost and can add up quickly, extending the cost well beyond that of a similar fire using other methods of suppression.

Post wildfire rehabilitation is vital to reduce post-fire potential of noxious weed invasion, including cheatgrass. Post-fire cheatgrass infestation can alter fire regimes dramatically by increasing the fire return intervals to every two to five years. Post-wildfire cheatgrass conversion is one of the biggest challenges in wildfire rehabilitation across the Great Basin, not just in Wyoming. The ESR actions in these Alternatives will help reduce the potential for cheatgrass invasion, thus maintaining FRCC. This not only includes seeding but those management actions that help areas achieve and maintain desired conditions of ESR projects to benefit Greater Sage-Grouse.

Currently, there is variability in the degree, extent, and seed type of wildfire rehabilitation within Greater Sage-Grouse habitat. Under this alternative, the current way of a case by case determination of ESR after wildfire would continue. Some post-wildfire temporary land management changes do occur to improve the probability of seedling establishment.

4.20.4 Alternative B

Surface disturbances and associated potential of human-caused fire starts from ROW construction activities would be reduced compared to Alternative A as new corridors would not be authorized (Map 2-5) and ROWs would be prohibited on 5,271,440 acres and avoided on 6,357,180 acres, thus reducing development activities and associated fire potential. Fire potential would be reduced as surface disturbances and associated potential human-caused and motorized vehicle fire starts from designated ROW construction/maintenance could be reduced by relocating or removing designations to current corridors that cross sage-grouse priority habitat.

Impacts from wind energy development would be similar to Alternative A, except areas closed to wind energy development would increase to 5,033,240 acres, thus reducing the surface area where surface disturbing activities and potential human-caused fire starts could occur. Fire potential would decrease as the number of projected wind turbines that would be constructed would be reduced compared to Alternative A.

Impacts from livestock grazing management and impacts to fire would be similar to those discussed under Alternative A, except grazing could be reduced in sage-grouse priority habitat to meet 20-30% forage allocations when rangelands in sage-grouse priority habitat are not meeting rangeland standards. This reduction in livestock grazing could increase fine fuel loads, which favor low-intensity fires, and increase overall plant community health. Fire potential could be reduced in sage-grouse priority habitat as livestock grazing practices would be used to help meet sage-grouse priority habitat requirements. In addition, fire potential could be reduced during drought periods as grazing allotments in sage-grouse priority habitats could be retired on all or part of an allotment, which could help maintain plant community and resistance to fire.

Reducing fluid minerals development by increasing closed areas to 6,886,890 acres and increasing NSO areas to 2,117,160 acres compared to Alternative A, would reduce the potential for human-caused fire starts. Fire potential from surface disturbing activities and human-caused fire starts associated with fluid minerals development would be reduced as the projected oil and gas wells (11,555) and CBNG wells (2,154) would be fewer compared to Alternative A. These actions would not only reduce the number of disturbed well sites but they would reduce associated access roads to these areas and potential fire ignition sources associated with motor vehicle travel.

The development of mineral materials and solid minerals would be prohibited on 6,992,690 acres, and 6,992,690 acres would be withdrawn from mineral location, which would protect more acres from potential human-caused fire starts and the degradation of plant community continuity caused by development activities. Native fuel loads could increase within these closures and thereby enhance overall habitat health, function, and resistance to changes in the fire return interval.

Overall, fuel loads would increase in sage-grouse priority habitat as total surface disturbances would be limited to a 3% disturbance threshold, which could increase the fire potential. Conversely, fire potential could also be reduced due to the improvement of vegetation health that would result from reducing/eliminating habitat fragmentation and open niches used by fire-prone invasive species. Fire frequency could be reduced by implementing management actions to prohibit surface disturbing activities such as ground clearing in sage-grouse priority habitat during brood rearing or nesting periods which would reduce the probability of invasive species establishment during the time of year when invasive species are most active.

Impacts to wildland fire from recreational activities would be reduced compared to those discussed under Alternative A. Fewer recreational activities or recreational activities in fewer areas could reduce impacts to fire management, as unintentional fires and ignition sources could be reduced.

Potential fires would be similar to Alternative A, as many management actions and impacts from vegetation management would be the same; however, the potential for fires could be reduced in sage-grouse priority areas as vegetation treatments would be designed to reduce wildfire risk and maintain habitat quality. Fire frequency could return to the natural fire regime schedule with the use of native seeds for reseeding efforts where there is a good probability of native seed re-establishment success. Resting treated areas for two full seasons would allow natural seeds and plants to better regenerate and establish which could further reduce invasive species establishment. Fire frequency in sage-grouse priority habitat could be reduced compared to Alternative A, as fuel treatments would be focused on protecting existing sagebrush ecosystems which would help maintain plant community health and reduce probability of fire-prone invasive species establishment or expansion.

Potential for wildland fires could decrease compared to Alternative A, as fire management would focus on using prescribed fire to protect, maintain, and enhance resources, reduce fuel loads, and promote healthy, diverse vegetation communities in sage-grouse priority habitat. Using prescribed fire in sage-grouse priority

habitat could decrease the intensity and frequency of wildland fires and facilitate suppression efforts. The increase in sagebrush protection in these areas would increase coarse fuel loads and move sage-grouse priority habitat closer to the historical fire regime fuel loads and frequency. Potential wildland fires would be reduced as fuel loads and vegetation treatment impacts from using fire as a treatment method on sagebrush would be limited to areas with at least 12 inches or greater of annual precipitation. This alternative has the use of preferred native seed the priority for use in ESR project in priority habitat. Additionally, Alternative B may require the temporary or long-term changes in grazing, wild horse management, or travel management to ensure that the desired conditions of ESR projects meet Greater Sage-Grouse objectives. This would, overall, improve the success of seeding to protect post-burn areas from cheatgrass infestations, thus maintaining or improving FRCC.

4.20.5 Alternative C

Impacts from ROW management actions on wildland fire potential would be similar to those described under Alternative A, except they would be reduced as the exclusion area for new corridors would increase to include sage-grouse priority habitat and general habitat, which would decrease the area where the potential for ignition sources and probability of wildland fire occurrence (through human presence on roads, corridors, and during development or maintenance of ROWs) could occur. The acres of ROW exclusion areas would increase to 11,556,490 acres under this alternative. However, areas where ROW development would be excluded, an increase in fuel loads could occur, which could increase the potential for more severe wildfires. Overall habitat health in these areas would be conserved compared to Alternative A and prescribed fire would not be used to treat sagebrush in less than 12-inch precipitation zones. Prescribed fire could be used in precipitation zones with less than 12 inches of precipitation to reduce wildfire potential, as a last resort and after all other treatment opportunities have been explored. The impacts on fire potential from wind energy development could be reduced in sage-grouse habitat as areas closed to development would increase to 11,531,340 acres, which would reduce the area where surface disturbing activities and ignition source potential could occur. However, the overall potential for wildfire from human-caused ignitions associated with wind turbine site construction and maintenance would be the same as Alternative B, with the same number of wind turbines projected (127 turbines) for the planning area.

Impacts on wildland fire resulting from livestock grazing management would be similar to those described under Alternative B, except impacts would be eliminated in sage-grouse priority habitat, as livestock grazing would be prohibited in these areas. Managing sage-grouse habitat to achieve sage-grouse habitat objectives (composition, function, and structure of native vegetative communities would be consistent with the reference state of the appropriate ESD) would provide for healthy, resilient habitat that would lower the potential for wildfires in sage-grouse habitat. Management actions during droughts and range improvement projects could reduce wildfire potential as the focus on sage-grouse priority habitat would be to maintain or improve sage-grouse habitat. However, there would likely be few, if any range improvements in these areas since there would be no livestock grazing in sage-grouse priority habitat.

Impacts from fluid mineral development would decrease compared to Alternative A, as areas closed to fluid mineral development would increase to 16,878,220 acres and NSO acres would increase to 2,117,160 acres which would restrict surface disturbing activities and human-caused fire ignitions associated with fluid minerals development. Fire potential would be reduced as fewer wells would be developed within the planning area (9,553 oil and gas wells; 1,594 CBNG wells) compared to Alternative A, which would reduce the number of disturbed acres to 85,140 acres (short-term disturbances) and 27,030 acres (long-term disturbances). The reduction in fluid minerals development would reduce associated access roads and potential fire ignition sources from motor vehicle travel and construction activities. The impacts from the development of mineral materials, locatable minerals, and solid minerals would be the same as those discussed under Alternative B.

Impacts from recreational activities on wildland fire potential would be similar and in many cases the same when compared to Alternative B, except impacts such as unintentional fires and vegetation removal would be reduced in sage-grouse general habitat as new roads would be prohibited and exceptions would only be allowed only outside of the four-mile buffer around active sage-grouse leks. Road upgrades would not be allowed (unless for safety), which would reduce the number of ignition sources from construction vehicles and workers. The ACEC/SIA designation areas would increase compared to Alternative B to also include the Audubon Important Bird Areas as nomination areas, which could increase the protected habitat and reduce recreation activities and potential human-caused fire starts and risk of fire starts from motorized vehicles.

Many management actions and impacts from vegetation management to fire potential would be the same as those in Alternative A, except fire potential could be reduced in sage-grouse priority and general habitat areas where vegetation treatments would be designed to benefit sage-grouse and retain sagebrush height. Fire frequency and intensity could be lower than in Alternative A as the focus of treatments would be increased and potential areas for treatments would cover sage-grouse priority and general habitats, which could improve plant community health. Unnatural wildfire frequency caused by fire-prone invasive plant species, such as cheatgrass, could be reduced as the natural fire regime would be encouraged with native seed use for plant restoration

Impacts associated with fire ecology management would be the same as Alternative B, except management focus would be on sage-grouse priority and general habitat within the planning area which could reduce fire potential by increasing the focused area. This alternative would have the greatest impact on the potential success of post-fire ESR by even further limiting grazing until the conditions meet Greater Sage-Grouse habitat objectives. The priority to use native seed is the same as under Alternative B. This would prevent cheatgrass infestation to improve FRCC.

4.20.6 Alternative D

Impacts from ROW management actions on wildland fire would be similar to those described under Alternative A, except they would be reduced because ROW exclusion areas would increase to 5,230,110 acres. This would decrease the area in which ROW activities could result in unintentional human-caused fires.

Wind energy development would be excluded on 424,820 acres and avoided on 4,608,420 acres, which would reduce the overall impact to fire potential compared to Alternative A by reducing surface disturbing activities that remove and degrade vegetation and increase the risk for human-caused fire starts. Fire potential would be reduced compared to Alternative A, as fewer wind turbines are projected to be constructed within the planning area (980 turbines; 22% reduction), which would reduce the potential for human-caused fire starts associated with construction activities.

Impacts from livestock grazing on wildland fire would be the same as those discussed under Alternative A, except grazing management would be modified similar to Alternative B to meet sage-grouse habitat requirements which could increase plant community health. Resultant reductions in grazing could increase fine fuel loads, which favor low-intensity fires. Fire potential could increase, as temporary use (which may be allowed during periods of drought and emergency) could reduce plant community health and fuel loads in these areas. During drought periods within sage-grouse core and connectivity habitat and where appropriate, the season of use and stocking rates could be adjusted, which could reduce stress on plants, help maintain plant community health, and increase resistance to fires. Although compared to Alternative A, the potential for fires would still be low in riparian habitat even though fuel loads would increase along with vegetation health as grazing management strategies would consider changes to season of use in riparian/wetland habitat.

Impacts on wildland fire from minerals development could be slightly reduced compared to Alternative A by increasing the areas closed to oil and gas development to 964,860 acres and decreasing CSU areas to 2,117,990 acres, which would restrict surface disturbing activities and human-caused fire starts associated with fluid minerals development. Impacts from fluid minerals development would be reduced when compared to Alternative A, as fewer oil and gas wells (13,083) and CBNG wells (2,686) would be developed, which would reduce the number of disturbed acres to 122,910 acres for short-term disturbances and 37,720 acres for long-term disturbances. The reduction in fluid minerals development would reduce associated access roads and potential fire ignition sources from motor vehicle travel and construction work. These well reductions, when compared to Alternative A, could increase native vegetation community health which could reduce the potential for catastrophic wildfires. The impact from development of mineral materials, locatable minerals, and coal and other solid minerals would be equivalent to that in Alternative A. Compared to Alternative A, non-energy leasable mineral activities within sage-grouse core and connectivity habitat would reduce fire potential by complying with surface occupancy and disturbance and density stipulations that would promote continuity among sage-grouse habitat and could increase overall health in these areas. Vegetation health and fire potential would also be reduced as more areas would be designated as new sage-grouse conservation ACECs/SIAs, which would decrease potential ignition sources by reducing surface disturbing activities in these areas.

Impacts on wildland fire from recreational activities would be similar to those described under Alternative A, except SRPs/RSUAs could be approved on a case-by-case basis when they are consistent with resource values. This could reduce potential ignition sources and reduce the number of disturbed areas, which could reduce invasive/noxious weed establishment and resultant impacts on wildland fire.

Fire potential could be reduced in sage-grouse core and connectivity habitat where vegetation treatments would be designed to reflect DPC, which would increase plant community health and increase resistance to fire. Impacts to fire would be reduced in sage-grouse priority and general habitat areas as treatments would follow WGFD Protocols for Treating Sagebrush to Benefit Sage-grouse (WGFD 2011), which would reduce fine fuel loads. Fire potential would be reduced, as vegetation treatments would only be allowed if they didn't contribute to exceeding the 9% threshold for disturbances in sage-grouse core habitat, which would reduce the area where invasive plant species could be established. Fire frequency and intensity could be lower than under Alternative A, as the focus of treatments (ID and implementation) would be in sage-grouse priority and general habitats as well as in annual grassland restoration where wildland fires are more prevalent. In addition, using native seeds could reduce the probability of fire-prone invasive species establishment and help fire frequency return to the natural fire regime.

Impacts associated with fire ecology management would be the same as those discussed under Alternative A.

4.20.7 Proposed Land Use Plan Amendments

The impacts to fire and fuels management from ROW construction would be similar to Alternative A, except ROW avoidance areas would increase by 3,748,650 acres. This could reduce ROW construction activities and the degree of impact on fire and fuels management. In addition, compared with Alternative A, impacts would be slightly reduced due to actions that would restrict new transmission projects to the proposed two-mile wide transmission line corridor and within 0.5 miles on either side of existing 115kv or larger transmission lines. Fire potential would increase from surface disturbing activities and associated human-caused ignition source where new ROWs and SUAs are issued outside of existing designated ROW corridors for buried utilities. Impacts to fire potential from these actions could be reduced as new ROW/SUA designations would be considered where it can be demonstrated they would not negatively impact sage-grouse populations.

Wind energy development would be excluded on 425,080 acres and avoided on 4,731,350 acres, which would reduce the overall impact to fire potential compared to Alternative A by reducing surface disturbing activities that remove and degrade vegetation and increase the risk for human-caused fire starts. Fire potential would be reduced compared to Alternative A, as fewer wind turbines are projected to be constructed within the planning area (127 turbines; 90% reduction), which would reduce the potential for human-caused fire starts associated with construction activities.

Impacts from livestock grazing would be similar to those described under Alternative A, except fire potential could be reduced as grazing management actions would be changed to address areas where grazing is impeding PHMA objectives. Drought management actions would reduce fire potential compared to Alternative A, as the season of use and stocking rates could be adjusted, which would reduce stress on plants, help maintain plant community health, and increase resistance to fires.

Impacts on wildland fire from fluid minerals development would be similar to those in Alternative A, except NSO acres (441,690) and CSU acres (6,438,480) would increase, which would reduce the potential for human-caused fire starts. The reduction in well numbers would also reduce the number of acres disturbed by fluids minerals development to 112,320 acres in the short term and 35,430 acres in the long term, which would also reduce the number of access roads associated with well development and reduce the potential for human-caused fire starts. Although fuel loads could increase, the maintenance and enhancement of vegetation health would reduce fire potential.

Impacts from mineral material disposals and solid mineral lease operations would be the same as those described under Alternative A. Impacts from coal surface mining would be similar to Alternative A, except they could be reduced by applying criterion 15 to make sure significant long-term impacts on sage-grouse do not occur. Impacts from non-energy leasable mineral development would be the same as those described under Alternative D.

Recreational activities and impacts to fire potential would be similar and in many cases the same when compared to Alternative A, except the potential for human-caused fire starts would be reduced, as new primary and secondary roads and Route Category Level 4 and 5 roads would avoid areas within 1.9 miles of the perimeter of occupied sage-grouse leks within PHMAs, while other new roads would be prohibited within 0.6 miles of sage-grouse leks within PHMAs. This reduction in new road construction could reduce disturbed areas and the establishment of invasive/noxious weeds. Impacts to fire management in OHV "open" areas (non-sand dune portions) could be reduced as travel would be limited to existing roads and trails which would reduce the risk of motorized vehicle fire starts.

Many management actions and impacts associated with vegetation management would be the same as those in Alternative D, except fire potential would be reduced because vegetation management actions would be applied to PHMAs and GHMAs. Maintaining a canopy of at least 15% in sagebrush would increase fuel loads as well as could increase overall sagebrush community health and resistance to low-intensity fires. Fire potential would be reduced due to the enhancement of plant community health, as vegetation would be managed to reflect DPC within PHMAs and GHMAs which could reduce invasive and noxious weeds as well as support a more natural fire regime. Impacts from grazing after vegetation treatments would be similar to those discussed under Alternative B, as grazing on treated areas would be deferred for two full growing seasons to allow for vegetation establishment and growth. Fire frequency and intensity could be lower than under Alternative A, as the focus of vegetation treatments would be to protect PHMAs and GHMAs as part of annual grassland restoration efforts, which would increase areas where treatments are used.

Impacts associated with fire management would be similar to those under Alternative A. The Proposed LUP Amendments would include Greater Sage-Grouse Wildfire and Invasive Annual Grass Assessment

(Appendix J). This assessment process sets the stage for identifying important sage-grouse occupied habitats and baseline data layers important in defining and prioritizing sage-grouse habitats. It would determine potential landscape scale management strategies. The management strategies considered in the assessment to increase sage-grouse habitat at landscape scales include; conservation, prevention, restoration, and monitoring and adaptive management. The strategies are adapted for fire operations (preparedness, suppression, and prevention activities), fuels management, post-fire rehabilitation, and habitat restoration (Chambers et al. 2014).

Creating and maintaining effective fuel treatments in strategic locations, prioritizing suppression of fires, in accordance with the Greater Sage-Grouse Wildfire and Invasive Annual Grass Assessment (Appendix J), for conservation and protection during fire operations and fuels management decision-making. Compared to Alternative A, this would reduce the size and intensity of wildland fires but would result in an increase in both fuels management and fire suppression costs. Fuels treatments with an emphasis on protecting existing sagebrush ecosystems would refer to WGFD Protocols for Treating Sagebrush to Benefit Sage-Grouse (WGFD 2011). These actions would restore and recover burned areas that are within PHMAs, which would reduce fires and reduce fuel loads in PHMAs.

Across Greater Sage-Grouse habitat, fire rehabilitation would prioritize the use of native seed under Alternatives B and C and the Proposed LUP Amendments. Historically native seeds are often more expensive than non-native seed used in fire rehabilitation. This prioritization of PHMAs among all fire rehabilitation may limit funding and resources for ESR on wildfires outside of Greater Sage-Grouse habitat. Depending on the severity and extent of the fire season nationwide, certain seed availability and prices can change. In years where lots of acres burn nationwide, the potential exists that some lower priority post-wildfire projects may not receive ESR funds. Also in these years the seeds needed for ESR, especially seed in high demand, may not be available. If native seed is available, the demand may be so high that seed prices will rise further, limiting the total acres of rehabilitation on BLM-administered and National Forest System land. There may only be a short-term effect on seed prices once the market adjusts to the demand.

This alternative has impacts similar to Alternative B in prioritizing use of native seed during ESR on Greater Sage-Grouse habitats. The Proposed LUP Amendments also propose to design post-fire land management to ensure persistence of seeded species or pre-burn natives. However, these post-burn changes in land management practices do not go to the extent that they do in Alternative C to ensure rehabilitation success. FRCC again would benefit from the emphasis on ESR to prevent conversion to cheatgrass and other invasive plant species.

4.21 WILDLIFE AND FISHERIES

This section presents potential impacts on wildlife and fisheries from management actions presented in Chapter 2. Existing conditions concerning wildlife and fisheries are described in Chapter 3 (Section 3.19).

The main habitat type that would be impacted from implementation of the management actions presented in Chapter 2 is sagebrush or areas with mixed sagebrush habitat components. Other habitats such as forests, waterways, and riparian areas may occur inside Greater Sage-Grouse core/priority habitat areas, but are either used very little or not at all in the case of forests and alpine areas. Species that use forested, riparian, wetland or waterways may benefit indirectly from management in Greater Sage-Grouse core/priority habitat areas. Without knowing where disturbing activities are going to occur in the future, making predictions of impacts to various habitats and the species that utilize them would be inaccurate. Because the focus of the amendments is on Greater Sage-Grouse and sagebrush habitats, the wildlife species included in this analysis will be mainly those that spend a major portion of their life history in sagebrush or mixed sagebrush habitats. Appendix M contains the Management Indicator Species Report for the BTNF, the MBNF and the TBNG identifies the likely effects of management decisions associated with the Greater Sage-Grouse Planning Decision on population trends for respective Management Indicator Species for each of these Planning Units.

4.21.1 Impact Indicators

Indicators of impacts on wildlife and fisheries are as follows:

- Acres and condition of native vegetation communities
- Degree/magnitude/level of connectivity between sagebrush and other native vegetation communities
- Degree/magnitude/level of human presence
- Degree/magnitude/level of surface disturbance and vegetation removal
- Introduction or development of non-natural structures or items into the native habitat.

4.21.2 Assumptions

The analysis is based on the following assumptions:

- Significant modifications to habitat suitability can impact the survivability and viability of populations (e.g., higher winter mortality, reduced reproductive success).
- Crucial winter ranges, transitional ranges, and parturition areas are critically important wildlife habitat.
- Fish and wildlife populations would continue to be managed by WGFD. BLM or Forest Service would continue to manage wildlife habitat.
- Natural variability in wildlife health, population levels, and habitat conditions would continue. Periods of mild or severe weather as well as outbreaks of wildlife disease or insects/diseases that impact habitat (e.g., mountain pine beetle, blister rust, mistletoe, and bleeding rust) could impact wildlife population levels.

- Precise, quantitative estimates of impacts generally are not possible because the exact locations of future actions are unknown, population data for wildlife species are often lacking, or habitat types affected by surface-disturbing activities cannot be predicted.

- Actions impacting one species have similar impacts on other species using the same habitats or areas.

- The more acreage of habitat protected from surface disturbance or human presence, the greater the benefit to the targeted species.

- Management actions in core/priority habitat areas for Greater Sage-Grouse that preclude or restrict development, including those not specifically aimed at conserving other wildlife species, are assumed to benefit wildlife where populations overlap with Greater Sage-Grouse core/priority habitat.

- The health of fisheries within the planning area is directly related to the overall health and functional capabilities of riparian/wetland resources, which in turn reflect watershed health.

- Any activities that affect the ecological condition of the watershed and its vegetative cover would directly or indirectly affect the aquatic environment. The degree of impact attributed to any one disturbance or series of disturbances is influenced by location within the watershed, time and degree of disturbance, existing vegetation, and hydrologic condition.

- Impacts from management for oil and gas development would only apply to new leases; existing development or existing leaseholders would not be impacted by these alternatives, unless specifically described under the management actions.

- Wildlife populations fluctuate, sometimes widely, in response to natural factors such as cycles in the abundance of prey base or extremes in seasonal weather (e.g., severe winters). It is often difficult to discern whether impacts on wildlife result from any specific management action or from population changes caused by natural factors. Changes to or stressors (e.g., increased human presence and noise) on habitat components such as vegetation, water, soil, or air are most likely to cause direct and indirect effects on wildlife and fish.

- Appropriate RDFs (Appendix B) will be applied; the analysis discloses the residual impacts that have the potential to occur after application of the RDFs.

4.21.3 Alternative A

Existing ROW would be used whenever possible for placement of new linear facilities. Exceptions could occur, and in those cases disturbance is to be limited and mitigated. If existing ROWs were used, disturbance to sagebrush habitat would likely be minimal due to the conditions of ROW corridors where the land has been previously disturbed from prior facility construction. Placing pipelines and power lines in already disturbed locations would reduce overall habitat loss and fragmentation of habitat.

Some species associated with grassland areas, such as mule deer and western meadowlark, could be disturbed or forced to abandon habitat if development of areas under existing ROWs occurred. Construction activities could disturb other wildlife if construction were to occur within occupied habitat, possibly causing species to vacate the area to lower quality habitat. Moving from desirable habitat can result in reduced health of animals, making them susceptible to disease or predation. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function,

forage, or cover that the original area provided. Some actions such as construction of pipelines, buried fiber-optic lines, and other subsurface actions likely would have short-term impacts, because proper reclamation should restore some level of habitat function in these areas that could be used by wildlife. Because of the long time frames required for some disturbed sites to return to pre-disturbance vegetation cover or the re-disturbance of a ROW corridor, certain impacts could be long-term. Aboveground ROW actions, such as communication sites and power lines, would have long-term potential for collision or electrocution of bats, raptors, and other avian species.

In TBNG and in case-by-case situations within the planning area where new ROWs are allowed to be developed, vegetation loss, habitat degradation, and invasion of exotic plant species could occur. Loss or degradation of habitat would impact terrestrial wildlife species and could force wildlife to move to other less desirable habitat for foraging or cover. New linear disturbances would introduce additional fragmentation into the landscape. Habitat fragmentation occurs when a contiguous habitat is intersected, divided, or segmented by disturbing activities. Fragmentation causes a reduction in usable ranges and the isolation of smaller, less mobile species, a loss of genetic integrity within species or populations, and an increase in abundance of habitat generalists that are characteristic of disturbed environments (i.e., competitors, predators, and parasites) (Harris 1984). Displaced wildlife tend to use lower quality habitats or compete with existing herds and livestock for forage and use private lands to a greater extent. Density dependency thresholds of suitable habitats for these species could be met, which ultimately could decrease herd size and genetic variability and increase disease frequency.

Closing Bates Hole and Sand Hills Management Area to new corridor designations would prevent habitat loss from linear ROW within the areas and could protect wildlife habitat from removal, loss, degradation, and invasion of exotic plant species. Wildlife species which use sagebrush habitat for food or shelter, such as pronghorn, northern sagebrush lizard and McCown's longspur, would benefit from this management within the Bates Hole area (WGFD 2010c).

Within the planning area, 285,930 acres are currently managed as ROW exclusion areas and 2,460,340 acres are managed as avoidance areas. Lands within the exclusion and avoidance areas would be managed to prevent habitat loss from linear ROWs and could protect wildlife habitat from removal, loss, degradation, and invasion of exotic plant species. Prohibiting new above ground structures would also prevent new habitat loss, disturbance, or life-cycle disruption, all of which would protect wildlife habitat. Linear corridors are desirable areas for predatory animals, such as raptors and red fox; reducing these areas may be beneficial to prey species but would also reduce hunting corridors for the predators. Preventing overhead structures in these areas could reduce the risk of predation from overhead predators, but also prevent the construction of overhead perches for hunting raptors. The risk of collision or electrocution of bird and bat species could be reduced where overhead structures are not allowed. Maintenance and upgrades of existing structures could result in short-term disturbance of wildlife from human and vehicle activity, but long-term impacts would be minimal.

To protect wildlife and avian species within the Kemmerer field office, new utility lines would be buried or anti-perching devices would be installed within sagebrush and/or semiarid shrub-dominated habitats. Anti-perch devices could protect small prey species from predation by raptors, ravens, or crows. Buried utility lines would prevent collision or electrocution of avian species from suspended wires.

Within the planning area, 1,254 wind turbines are projected to be developed. The development of wind energy could cause habitat loss, and both short- and long-term impacts to wildlife habitat. Large wind energy fields also involve surface disturbance, which could permanently change the habitat structure, affecting wildlife. Disturbance during installation of towers, roads, and infrastructure could force wildlife away from preferred habitat. Some smaller prey species will avoid and abandon areas where overhead

structures such as power lines and towers are present due to the increased risk of avian predators. However, overhead structures could provide perches for hunting raptors or other predatory birds.

Initial construction may result in displacement of some wildlife and raptor species from breeding and foraging habitat within the construction area. Construction of wind turbines throughout the planning area may create collision hazards for raptors, bats, and multiple avian species. Studies have documented deaths of avian and bat species from wind turbines, although the levels of collision and death vary in the scientific research (Cohn 2008; Madders and Whitfield 2006). Collision levels fluctuate based on habitat, terrain, elevation and even weather conditions (Madders and Whitfield 2006). Prediction of accurate bird or bat losses from wind development is currently not available; however, it can be assumed that some losses of these species will occur. Bats most commonly found within wind farms with the highest mortality are the eastern red bat and hoary bat, both found within the planning area (Cohn 2008).

Specific wildlife impacts from wind energy development have been shown for some big game species. Sawyer et al. (2006) determined that mule deer are displaced from suitable habitat by human activity related to the development and operation of gas wells in western Wyoming. While these studies suggest a potential displacement effect from the development of wind energy, the magnitude of the displacement effect from wind development may be different from other developments that use different technology and have more human activity associated with their operations. For example, a recent study regarding interactions of a transplanted elk population with an operating wind facility in Oklahoma found no evidence that turbines had a significant impact on elk use of the surrounding area (Walter et al. 2006). Similarly, Johnson et al. (2000) found no effect on pronghorn use of the Phase I and II Foote Creek Rim project in Wyoming.

Restrictions on MET towers in Kemmerer and Rawlins could reduce impacts to smaller wildlife species by preventing the perching of raptors and removing collision obstacles for avian and bat species within sagebrush habitat.

Land disposals within the Casper field office could impact wildlife species depending on the parcel of land and the entity which acquires the land. Most land disposals do not occur without review for major impacts to wildlife and wildlife habitat. Land acquisitions within the Casper field office could impact wildlife species depending on the resources found on the parcel of land. Acquisitions could lead to obtaining valuable habitat for wildlife where possible.

Using the BLM policy in IM No. WO-2009-007 and BLM Handbook H-4180-1 and the equivalent Forest Service Annual Operating Instructions to evaluate land health standard achievement in Greater Sage-Grouse core habitat could identify where land health standards are not being met. If appropriate action is taken by issuing a decision to modify grazing, construct management facilities, or implement treatments, impacts to wildlife from livestock grazing could be reduced. Impacts from standards not being met include habitat loss or degradation, reduction of forage or cover vegetation for wildlife, and spread of invasive plant species. Soil erosion or compaction of soils may also lead to habitat loss and damage to water sources. Implementation of standards could reduce effects to wildlife habitat from the impacts described above.

Adjustments in grazing use or management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands could also result in actions that would balance the impacts of grazing while sustaining wildlife species and their habitat. Making adjustments to grazing management as a result of monitoring could provide overall improvements in landscape health, prevent or reduce the spread of invasive, non-native plant species, provide additional forage, and allow for greater cover habitat for wildlife.

Forest Service livestock grazing practices to provide adequate forage, cover and other habitat needs for Greater Sage-Grouse could provide forage and cover for other sagebrush dependent species such as pronghorn, mule deer, and ground nesting birds.

Implementing conversions in kinds of livestock and grazing season could maintain a higher level of habitat function for wildlife and livestock use. Conversions in types of livestock could alter grazing patterns and vegetation use, which could benefit some wildlife and impact others depending on which types of livestock are introduced. There is a dietary overlap between elk and cattle (Hansen and Reid 1975); there is a smaller dietary overlap between cattle and pronghorn and deer (Hansen and Reid 1975). However, the forage use varies between seasons; cattle graze pastures in the summer and fall, and elk and mule deer use similar pasture in the spring and summer (Taylor et al. 2004). Domestic sheep and cattle will directly compete for graminoid forage, especially in sagebrush habitat (Beck and Peek 2005).

Water developments could also adversely affect wildlife habitat, particularly in winter and parturition ranges, through reductions in forage due to increased distribution of animals. However, implementation of the Wyoming Standards for Healthy Rangelands on BLM-administered lands could ensure that habitat for wildlife is not degraded by over-use of livestock. Adverse impacts of fences on wildlife within the planning area would be minimal because of requirements that fences are located so as not to impede wildlife movement, and that the fences be removed, modified, or reconstructed where documented conflicts with wildlife occurred. Future livestock conversions (sheep to cattle or vice versa) would be carefully analyzed. Sustainability reviews would be required before conversions, which would benefit the range.

Management of livestock allotments within the Casper field office and BTNF and TBNG for drought conditions could provide wildlife forage and cover during periods of drought.

Range improvement projects within the planning area could initially cause short-term impacts from habitat loss or damage during the improvement construction or project timespan. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. Long term, many improvements could provide additional vegetation for forage or cover, increased access to the landscape, additional water resources, or access to mineral supplements. In TBNG and MBNF, where wildlife escape ramps are required in stock water troughs and tanks, the potential for drowning by birds and small mammals could be reduced or prevented.

Fence modification, removal, or construction of new fences to BLM standards would provide varying impacts to wildlife species. Fences can provide wildlife with less competition from livestock for forage when fences exclude livestock from grazing habitat. Fences can also impact wildlife by creating travel barriers, altering distribution patterns, increasing stress and energy loss, and causing injury or death from entanglement. Modifying or constructing fences to BLM standards could reduce impacts to wildlife from fences by decreasing the chances of entanglement. Where fences are constructed with perch inhibitors for raptors, prey species would be less likely to be subject to hunting from predatory bird species; however, predatory birds would not benefit from hunting perches. Where fences were constructed with anti-collision standards for Special Status Species, wildlife would be less likely to be injured or perish from impact with fences. Removal of fences reduces threats of injury or death from impacts with fences, enhances travel corridors, and could allow access to additional forage and cover.

In the Casper, Kemmerer, Pinedale, and Rock Springs field offices, prohibiting the placement of mineral supplements within 0.25 miles of lentic/lotic water and wetland/riparian areas, as well as Greater Sage-Grouse leks, would prevent stream bank erosion, vegetation loss, and nutrient loading in surface water, preserve aquatic habitats, and prevent the degradation of sensitive habitat. Mineral supplement blocks for livestock and wildlife use would be placed in locations that both promote proper grazing distribution and prevent inappropriate livestock use on riparian habitat, minimizing soil compaction and runoff near surface waters, and could decrease grazing pressure and competition for riparian vegetation.

Current management for livestock trailing in Casper, Kemmerer and Pinedale could impact wildlife from movement of herds through habitat, causing loss of vegetation for forage and cover, soil compaction, erosion, trampling of vegetation and habitat, and the spread of invasive non-native plant species.

Managing riparian and wetland areas for PFC/Wyoming Standards for Rangeland Health/improving habitat conditions could decrease runoff, sedimentation, and cementation of substrates in-stream channels which would provide preferential habitat conditions for aquatic species for feeding, cover, and reproduction. Maintaining or improving riparian areas and wetlands could improve water quality, reduce the likelihood of stream bank erosion, stream channel alteration, and loss of wetland or riparian vegetation. Wildlife habitat and forage could be enhanced from management of wetland and riparian areas by applying short duration grazing, preventing, or limiting utilization of woody species, and seasonal use regimens. Because livestock tend to congregate near water sources, management focused toward riparian and wetland areas could reduce heavy impacts from soil compaction, erosion, and overgrazing of vegetation resources, which could improve overall habitat conditions in these areas for both terrestrial and aquatic wildlife species.

Where water developments are proposed or considered in sensitive wildlife habitat and are developed where wildlife could benefit from the development, short-term impacts could occur from the initial construction, human presence, habitat disturbance, and vegetation loss. Wildlife could vacate the area until construction of improvements was complete. During this time, wildlife could be forced to inhabit lower quality habitat for forage or cover, which could impact health and reproduction until species could return to the area. Once construction was complete, habitat conditions in the area would return over time if grazing was monitored and over-use of the area by livestock did not occur. Access to water sources would be beneficial to terrestrial wildlife. However, water developments could also adversely affect wildlife habitat, particularly in winter and parturition ranges, through reductions in forage due to increased distribution of animals. However, implementation of the Wyoming Standards for Healthy Rangelands on BLM-administered lands could ensure that habitat for wildlife species is not degraded by over-use of livestock.

Allowing exceptions to lease stipulations, COAs, and terms and conditions to be considered on a case-by-case basis for Greater Sage-Grouse habitat could allow for additional surface disturbing activities in sagebrush habitat during the restricted time period, such as disturbance from roads, structures, power lines, and human activity, and could disrupt contiguous, uninterrupted habitat and result in overall habitat loss. It is unknown, however, what type or degree of exceptions would occur, because the outcome is dependent on each lease and the habitat where the lease is being developed.

It is estimated that a total of 16,411 oil, gas, and CBNG wells would be developed under Alternative A within the planning area. There would be 130,330 acres of initial surface disturbance and 39,050 acres of long-term disturbance from oil and gas development. The primary impacts on wildlife species (especially big game) from minerals development within the planning area would be the reduction in usable wildlife habitat and disruption of migration corridors that link crucial habitats (winter range) and parturition areas. Reductions would be particularly severe in areas with continuous surface disturbance. As discussed by Bartmann et al. (1992), crowding of animals may have a density-dependent impact of reducing animal survival and damaging resources. Human disturbance of big game results in increased energy costs to the alerted animal (Bromley 1985). The disturbed big game animal incurs a physiological cost, either through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential (Geist 1978).

Closing 871,780 acres to new oil and gas leasing could help protect these areas from future development by providing unfragmented blocks of habitat and migration corridors between habitat areas, as well as reducing habitat loss and disturbance from humans and infrastructure. Under Alternative A, 40,980 acres

would be managed as NSO, and 5,015,210 acres would be CSU. Greater Sage-Grouse lek buffers for NSO and CSU restrictions could provide habitat protection in areas where the lek buffers overlap with big game habitat (Table 4-108).

Table 4-108. Big Game Habitat Overlap with Sage-Grouse Lek Buffers

Restriction	Acres Alternative A	Acres Alternative D	Acres Proposed LUP Amendments
Pronghorn			
NSO	48,770	-	477,080
CSU	5,653,000	2,507,340	2,472,170
Rocky Mountain Elk			
NSO	22,860	-	186,820
CSU	2,241,110	947,130	913,600
Mule Deer			
NSO	37,290	-	376,240
CSU	4,296,400	1,944,640	1,927,490
White Tail Deer			
NSO	1,510	-	12,510
CSU	208,290	130,460	178,230
Moose			
NSO	6,150	-	76,890
CSU	721,560	260,710	246,600
Bighorn Sheep			
NSO	1,080	-	6,680
CSU	61,620	32,770	31,440

The Sublette Mule Deer Study was conducted between 1998 and 2003 by West Inc.; its goal was to determine whether natural gas development affected habitat selection patterns and, ultimately, the distribution of wintering mule deer in western Wyoming. Following 1 year of development, 17% of the study area classified as high use before development had changed to medium-low or low use, and by year 3 of development, 40% of the study area classified as low use before development had changed to medium-high or high use areas.

Further, research conducted by Sawyer et al. (2006) suggests winter habitat selection and distribution patterns of mule deer were affected by well pad development. Changes in habitat selection by mule deer appeared to be immediate (i.e., year 1 of development), and through 3 years of development, no evidence was found that suggested mule deer acclimated or habituated to well pads. These results reflect the ability of mule deer to avoid localized disturbances and habitat perturbations without completely abandoning their home ranges (Sawyer et al. 2006). These results were collected during the winter drilling programs by various oil and gas companies to indicate the effects of drilling during the crucial wintering periods. Thus far in the study, the results indicate that mule deer use patterns are changing not only because of changes in timing restrictions for surface-disturbing and human disruptive activities, but are a culmination of habitat fragmentation, year-round human disruptive activities, and placement of development. Mule deer

progressively used areas farther from well pads as development progressed, but only moved a defined distance, suggesting home ranges would not be completely abandoned (Sawyer et al. 2006). Further, Sawyer et al. (2006) suggests that reducing the level of human activity during the production and development phases, as well as limiting public access and developing road management strategies, would reduce disturbances to wintering mule deer. Natural gas development on the Pinedale Mesa has displaced mule deer to less suitable habitats. Within 3 years, the highest probability of mule deer use was 2.3 miles (3.7 kilometers) away from well pads. The research suggests that winter habitat selection and distribution patterns of mule deer are affected by well pad development and that changes in habitat selection appear to be rapid.

WGFD estimates that 170 acres surrounding each well pad is the minimum area in which impacts on pronghorn would occur (WGFD 2004b). The greater mobility and adaptability of this species to human activity and disturbed areas likely would prevent long-term population impacts. However, it is feasible that pronghorn behavior or populations could be altered at some level of development.

Disturbance of big game may contribute to reduced reproductive rates due to reduced feeding, feeding in poor quality habitats, or feeding on rough forage (Gillin and Irwin 1985). Research conducted by Gillin and Irwin (1985) in the BTNF found seismic activity caused displacement of elk within home ranges by an average of 0.75 miles and into dense (greater than 70% canopy) forests with reduced forage. Displacement was observed to be rapid on spring range when calves were less than one month of age. Oil and gas exploration and field development in the Riley Ridge Project area was found to change elk distribution after drilling one well; after three wells were drilled, elk abandoned 6,000 acres of winter range. After drilling ceased, elk returned to the area. Further drilling activities in elk calving areas also caused elk to temporarily abandon the Lake Ridge calving area. Elk abandoned the Snider Basin calving area in 1984 and returned a year later when drilling activity left the basin. Elk have until now been able to find suitable, undisturbed habitats away from human activity; however, continued development could lead to abandonment of their historic ranges, in the last native winter foraging area on the Wyoming Range (Johnson 1985). A study conducted by Hayden-Wing Associates (1990) found a similar response in the Graphite Hollow/Rock Creek Winter Range where elk moved 0.5 to 2.4 miles away from a well site.

Sawyer et al. (2007) indicate that the effectiveness of elk habitat in forested regions declines when road densities exceed one mile per square mile. Behavioral response to traffic is influenced by topography and forest canopy adjacent to roads, and in some cases, road closures have been shown to decrease elk movements and increase survival.

As densities of wells, roads, and facilities increase, habitats within and near well fields become progressively less effective until most animals no longer use these areas. Although vegetation and other natural features may remain physically unaltered, wildlife make proportionately less use of areas near oil and gas facilities. Animals that remain within the affected zones are subjected to increased physiological stress. This avoidance and stress response impairs habitat function by reducing the capability of wildlife to use the habitat effectively. In addition, physical or psychological barriers lead to fragmentation of habitats, further limiting the availability of effective habitat. An area of intensive activity or construction becomes a barrier when animals cannot or will not cross it to access otherwise suitable habitat. These impacts are especially problematic when they occur within limiting habitat components such as crucial winter ranges and reproductive habitats (WGFD 2004b).

As acreages of surface disturbance and human activity levels increase, the quality and quantity of wildlife habitats likely would be reduced. Habitat fragmentation occurs when a contiguous habitat is intersected, divided, or segmented by disturbing activities. Fragmentation causes a reduction in usable ranges and the isolation of smaller, less mobile species, a loss of genetic integrity within species or populations, and an increase in abundance of habitat generalists that are characteristic of disturbed environments (i.e.,

competitors, predators, and parasites) (Harris 1984). Displaced wildlife tend to use lower quality habitats or compete with existing herds and livestock for forage and use private lands to a greater extent. Density dependency thresholds of suitable habitats for these species could be met, which ultimately could decrease herd size and genetic variability and increase disease frequency.

Forage loss and increased human activity from surface disturbance and other disruptive activities could result in reduced wildlife species diversity, modifications in population distribution or numbers, or possible habitat abandonment. Reclaimed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided.

Human disturbance near raptor nest sites could result in the abandonment of the nest, high nestling mortality from overheating, chilling, or desiccation when young are left unattended, premature fledging, and ejection of eggs or young from the nest. Raptors that successfully nest during a disturbance may abandon the nesting territory the following year. Responses of nesting raptors to human disturbance typically are determined by the type, duration, magnitude, noise level, and timing of activity relative to nesting phenology. Although some level of habituation to disturbance could occur, repeated flushing of adult raptors increases energy expenditure during foraging and decreases energy ingestion, depleting energy reserves and resulting in premature mortality during harsh conditions. Evidence suggests that some falcons, ospreys, and owls are generally more tolerant of human-induced disturbance and human environments; golden eagles, turkey vultures, northern harriers, Cooper's hawks, and sharp-shinned hawks appear much less tolerant; and buteos exhibit a wide range of acceptance levels. Raptors are less tolerant of disturbance when populations of prey species are at low levels (Romin and Muck 2002).

Geophysical exploration can impact wildlife in many ways. Use of vehicles for seismic projects or vibroseis trucks in the open landscape can crush vegetation, and human and vehicle presence can cause wildlife to vacate the area. During this time, wildlife could be forced to inhabit lower quality habitat for forage or cover which could impact health and reproduction until species could return to the area. Once exploration was complete, habitat conditions in the area would return over time, depending on habitat and weather conditions. Seismic lines from vibroseis trucks can open up corridors that could be used by predatory animals. Vehicles could cause mortality by crushing nesting birds or colliding with wildlife. Areas where geophysical operations were prohibited totally, through buffer distances, or seasonally (Pinedale, March 1 to May 15; 8:00 am to 8:00 pm) would provide wildlife species protection from the impacts listed above.

Offsite mitigation for oil and gas development could provide improvements to wildlife habitat for species which inhabit those areas being mitigated. The initial mitigation projects could displace wildlife species from human and vehicle presence, causing wildlife to flee to other, possibly lower quality habitat. Displacement could cause short-term impacts from stress from fleeing or inadequate forage, shelter, or breeding habitat. Long term, wildlife could benefit from mitigation of habitat with increased forage, shelter, or breeding habitat.

Working with project proponents in siting projects in locations containing the least sensitive habitats to minimize impacts to sensitive resources could reduce loss of higher quality habitat for wildlife that use or inhabit these areas and may allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects wildlife from human and other disturbance and allows for corridors for migration and travel. Disturbance can result in wildlife moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a decline in wildlife populations.

Requiring reclamation bonds for drilling or surface disturbance provides insurance that funding is available for reclamation and compliance of the lease terms, if a leaseholder abandons the project without conducting proper surface reclamation and other project requirements. Reclamation bonds could provide wildlife with

habitat improvement and recovery in areas disturbed by oil, gas and other surface disturbing activities if project abandonment occurs.

Disposal of produced water from CBNG can be treated and disposed of in several different ways in Wyoming, depending on location and quality of the water. If treated properly, disposal of water into waterways or through reinjection should not impact wildlife due to water quality. However, injection facilities have continued human presence and truck traffic. Careful placement of future water injection wells is essential for the continued protection of sensitive habitats and future wildlife population expansion. Discharge of produced water resulting from CBNG extraction to surface water features could affect aquatic habitat by altering local hydrologic conditions of receiving water bodies. If disposal pits are used for produced water, impacts to wildlife could occur if ponds were not managed properly. Produced water from natural gas wells can be highly alkaline and contain very high concentrations of salt (USFWS 2006b). If waterfowl were to enter the ponds, they could accumulate high concentrations of salt in their feathers, causing them to drown from the excess weight. If water was ingested by wildlife, the salts could accumulate in their tissues which could cause damage if toxic levels built up.

Managing split estate lands within the Pinedale field office subject to the same stipulations as leased federal estate lands could provide additional protections to wildlife and wildlife habitat through federal oil and gas lease stipulations provided in the Pinedale RMP. Negotiating federal management for non-federal minerals under federal ownership in MBNF could provide additional protections to wildlife and wildlife habitat through federal oil and gas lease stipulations provided in the MBNF LRMP.

If coal lease applications were approved, appropriate mitigation measures would be developed. Effects to wildlife habitat could be extensive, depending on the type (surface/subsurface) and location of the coal development. Coal lease activities could cause displacement of wildlife from developed areas, avoidance of a larger area around the development because of human presence and noise, and possible offsite impacts, including erosion and spread of invasive, non-native plant species. Depending on the scale and location of the disturbance to critical wildlife habitats, the effects could be more immediate. Allowing coal exploration activities in Greater Sage-Grouse core habitat could cause short-term impacts to wildlife from human or vehicle presence, disturbance or removal of vegetation during exploratory drilling, and noise from vehicles and equipment, all of which could cause wildlife to abandon the area.

Under Alternative A, 261,000 acres are closed to non-energy, solid leasable mineral leasing. Allowing prospecting for new leases could be considered on a case-by case basis. Most of the non-energy leasable mineral resources within the planning area are trona and phosphate. Trona mining occurs in primarily sub-surface mines where disturbance to wildlife habitat is low. Human presence and vehicle use from the mine to processing areas could cause displacement of wildlife from vehicles and noise, avoidance of a larger area around the development because of human presence, noise, and possible collisions from vehicles. Vehicle routes are prone to use by predators, which would benefit predators (raptors, coyote, red fox, raven) but would likely impact prey species (cottontail rabbit, wandering garter snake, and northern sagebrush lizard) by increasing predation. Impacts from phosphate would be similar although more habitat impacts from loss, disturbance, and erosion could occur from open pit mining.

The portions of the planning area in Greater Sage-Grouse core habitat withdrawn from locatable mineral entry (1,761,550 acres) would continue to have protection of sensitive resources, and would prevent effects from mineral extraction to fish and wildlife habitat.

Salable minerals within Greater Sage-Grouse core habitat would continue to be open where authorized. Impacts could include displacement of wildlife from exploration or pit areas, avoidance of a larger area around the development because of human presence and noise, and possible offsite impacts, including erosion and the spread of invasive, non-native plant species. Currently, 472,800 acres are closed to mineral

material exploration, sales, and free use permits. These areas would not have impacts to wildlife from mineral material activity.

Allowing salable mineral pits to persist after they are no longer in use could reduce short-term impacts of reclamation from human and vehicle presence; however, depending on how the area is used after minerals are no longer removed, impacts could be varied. If the area is allowed to naturally reclaim, impacts to wildlife habitat could be low, aside from the possible spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species. If the area is used for recreation or does not naturally reclaim, erosion, sediment runoff, and spread of invasive, non-native plant species could occur, impacting wildlife species and habitat use.

Dispersed recreation activities that increase human presence could have a localized impact on wildlife habitat. Displacement from human and vehicle activities moves animals into less desirable habitat and increases competition for available resources with other species and uses. Spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species could occur from vehicles and human tracking from one area to another. Allowing SRPs for large events or events that involve surface disturbing activity could lead to direct or indirect impacts on wildlife habitat, particularly in areas that contain known or potential populations and habitats. Impacts to wildlife occur from displacement and physiological stress from human presence and activity during sensitive life stages. Stipulations placed on SRPs in accordance with federal protections and BLM policy for water, soils, and Special Status Species would minimize the potential for impacts to wildlife habitat. Restrictions of SRPs within two miles of active Greater Sage-Grouse display grounds from March 1 to June 15 in the TBNG would reduce impacts to the habitat within and adjacent to those areas.

"Open" OHV areas could impact wildlife from disturbance from human presence and noise, and from possible collisions with vehicles. The open OHV areas in the Casper, Rawlins, and Rock Springs field offices (Poison Spider OHV Park [285 acres]; Dune Pond Cooperative Management Area [3,736 acres]; and a portion of the Greater Sand Dunes Recreation Area [529 acres]) have large areas of sand dunes as the open use area, which is not a desired habitat for most wildlife species. Because these areas are existing use areas, it is likely that most wildlife have already abandoned use or avoid the area. Impacts to big game species, specifically pronghorn, would be moderate and include displacement and increased stress during critical time periods. Off road, open OHV use in areas outside of the dune areas can degrade vegetation and lead to erosion and habitat loss, reduced quality of habitat, and lead to the introduction and spread of invasive, non-native plants that can further degrade habitat quality and change habitat composition.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within Greater Sage-Grouse priority habitat, could limit impacts to wildlife from vehicle use. The miles of routes that could be limited cannot be determined until transportation planning is completed, but limiting new roads, routes, and cross-country travel until the planning occurs could prevent some disturbance to wildlife habitat. Cross-country vehicle use can open up corridors that could be used by predatory animals, and additional vehicle traffic could use the pathway. Vehicles could cause mortality from crushing nesting birds or colliding with wildlife. Linear disturbances can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following vehicle passage.

Avoiding surface disturbing activities or occupancy within 0.25 mile of occupied Greater Sage-Grouse leks in Casper (except for Bates Hole and Fish Creek/Willow Creek), Kemmerer, Newcastle, Pinedale (in Traditional Leasing Areas and Unavailable Areas), Rawlins, Rock Springs (including Jack Morrow Hills), and TBNG could prevent habitat loss or human presence within the buffered areas. The 0.25 mile area surrounding the lek would prevent habitat fragmentation and the impacts from surface disturbance such as

vegetation and habitat loss, soil loss and erosion, or the introduction of invasive, non-native plant species such as cheatgrass, which can alter the composition of native species for forage and cover for special status wildlife.

Management in the Bates Hole and Fish Creek/Willow Creek area of the Casper Field Office restricts or prohibits surface disturbing activity within 0.75 miles of occupied Greater Sage-Grouse leks. In areas with over 10% canopy cover, surface disturbing activities would be avoided within four miles of occupied Greater Sage-Grouse leks. The additional 0.5-mile distance from leks, as compared to the other areas under Alternative A, would allow for greater protection from surface disturbing activities, habitat loss, and contiguous habitat areas. The four-mile buffer in areas with over 10% canopy cover would provide ideal habitat protection and connectivity, as well as allowing for minimal disturbance to wildlife within these areas. Birds in these protected areas are expected to remain/return to leks and continue reproductive activities to maintain or increase population numbers.

Closing, rehabilitating, or reclaiming unused roads or trails could provide fewer disturbances from occasional vehicle or human presence and could improve habitat conditions by removing linear disturbances, allowing for greater habitat connectivity, and providing additional vegetation resources for forage or cover. Vehicle routes are prone to use by predators (raptors, coyote, red fox, raven); prey species (cottontail rabbit, wandering garter snake, and northern sagebrush lizard) could benefit from the rehabilitation of unused roads or trails which could reduce the presence of predatory animals. In the Kemmerer field office, not upgrading designated roads could reduce surface disturbance from upgrading activities, preventing vegetation and soil loss, sedimentation, and possible displacement of wildlife from human and vehicle presence.

Designing seed mixes or plantings for vegetation types that meet DFCs for rehabilitation in the BTNF could lead to habitat re-establishment with appropriate species which could provide desirable habitat for wildlife species. Native species are ideal, but if the nutrition and habitat quality were commensurate with natives, vegetation could benefit wildlife and achieve DFCs.

Vegetation treatments for Greater Sage-Grouse and sagebrush within the planning area could provide sagebrush obligate wildlife habitat, forage, and cover within these areas. Initial treatments could cause displacement from human and vehicle activities which could move animals into less desirable habitat and could increase competition for available resources with other species and habitat uses. Limiting treatments within sagebrush habitat in the TBNG to 15% to 20% could prevent habitat fragmentation and provide varied vegetation structure within the greater habitat area. Limiting prescribed burns to specific canopy cover, vegetation composition, patch size, or amount of precipitation within sagebrush habitat could cause vegetation treatments to be maximized for the conditions and habitat structure. Wildlife could benefit from carefully managed prescribed burn treatments as described above. Resting treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Rested areas could provide wildlife with new vegetation for forage without competition with livestock during the rest period. Not allowing treatments in known Greater Sage-Grouse winter habitat in the TBNG with the exception to strategically reduce wildland fire risk could protect habitat components important to sagebrush obligate species, especially those who use winter habitat such as sagebrush vole and pronghorn.

Depending on the extent, location, severity, and seral type affected, unplanned ignitions would have short-term impacts on terrestrial wildlife species by removing or degrading habitat for some species, injuring or killing slow-moving species, causing habitat avoidance and changes in species movement patterns, or reducing population viability and increasing the potential to list a species under the ESA. In areas that are available for fuels treatments, changes in vegetation can result in negative impacts on terrestrial wildlife,

such as direct habitat loss, habitat fragmentation, and disruption to species; however, it can also result in beneficial impacts, such as habitat restoration.

A concern of resetting vegetation seral stage through fuels management is the invasion of undesirable plant species. Noxious and invasive weeds are often of lower value to wildlife and degrade wildlife habitat by reducing optimal cover or food. Sagebrush-steppe communities are among the ecosystems most vulnerable to invasion and degradation by invasive weeds. Cheatgrass invasion is also a threat to some treatment areas. Invasive non-native plants with little or no forage value for big game species are increasing in some areas. The greatest impacts have occurred to big game winter range areas with low precipitation rates. Not only can invasive species outcompete most native plants when moisture is limited, they can also change site-specific fire ecology and result in the loss of critical shrub communities. Cheatgrass would provide some short-term forage benefits to big game species while in early stages of growth; however, it lacks the ability to provide high quality forage during most of the year.

Fire suppression removes vegetation and disturbs soil and can have both short- and long-term impacts on big game and other habitats. For example, using heavy equipment to construct fire lines can cause habitat loss, degradation, and fragmentation in the short term. Moreover, if not rehabilitated, these fire lines can cause erosion and provide opportunities for the spread of undesirable plant species, thereby resulting in long-term adverse impacts on wildlife habitat; therefore, timely rehabilitation following fire is important to maintaining the quality of wildlife habitats.

Although both planned and unplanned wildland fire adversely impacts wildlife habitats in the short term by removing vegetation and disturbing soil, the long-term benefits of wildland fire often outweigh the short-term adverse impacts. For example, prescribed fire can be used to restore conditions benefiting wildlife species favoring early plant succession stages and young age classes of woody plants (McAninch et al. 1984). Prolonged fire suppression has allowed fuels to build up to the point that an unplanned wildfire is likely to be much larger in size and greater in intensity.

Some wildlife species thrive on the occurrence of fire. The herbaceous and woody plants that establish following a burn provide abundant leaves and seeds, which are used by small rodents and birds that, in turn, are important prey for a variety of avian and mammalian predators. Over the short-term, the wildlife community is changed dramatically by a fire, as taller and denser vegetation is replaced by a more open habitat. As the area gradually recovers, however, many of the pre-fire components become re-established, and the area again supports a community associated with denser forests. This cycle may take decades or centuries, depending on the dominant plant species, or it might never occur if climatic conditions are no longer suitable for the former dominant species. Wallmo (1980) suggests that fire improves the palatability of forage and causes browse plants to resprout close to the ground, putting the current season's growth within reach of deer for several years. Additionally, wildland fire can improve the quality of wildlife habitat by releasing soil nutrients, reducing fuel load, or setting back trees encroaching into shrubland or grassland habitats.

Fuels treatments could be beneficial for species that depend on younger seral stages. In the long term, wildlife would benefit from most wildfires and fuels management, due to an increase in vegetation productivity and to increased plant diversity and age classes. This would, in turn, provide additional forage, cover, and prey base. Mimicking natural periodic disturbance is often necessary in order to stimulate plant productivity, increase diversity, and increase nutritional value. Foraging opportunities for big game and other herbivores would increase as understory grasses, forbs, and shrubs become re-established. The benefits for mule deer and elk are likely to be long-term. Directly following application of fire there is generally more palatable browse available for wild ungulates. Improving vegetation in upland areas would provide more forage to big game species and other herbivorous species that occur in these areas and would result in direct beneficial impacts. In addition, fuels treatments in upland areas often result in increased

forage production, which diverts livestock and wildlife use from riparian and wetland areas. This would increase the vigor and structural diversity of these plant communities.

Following a wildfire, ESR is implemented to protect and conserve habitats that have sustained damage or degradation from catastrophic wildfire. Typically these activities are beneficial for terrestrial wildlife species and are designed to improve the overall condition of the area, which in turn improves habitat for wildlife. For example, weed-free seeding would stabilize soil and reduce the spread of noxious weeds. Additionally, replacing organic matter in disturbed areas would protect topsoil and provide a suitable bed for the restoration of a native vegetative community.

The noise from heavy equipment and chainsaws could temporarily disperse bird species from breeding and nesting habitat and wildlife from occupied habitat. Prescribed burning could also disturb nesting bird species from smoke inadvertently drifting into occupied habitat. These activities could remove suitable habitat or other desirable vegetation. Disturbances from heavy equipment, chainsaws, and prescribed burning would be localized and short-term. Most wildlife species would move into adjacent untreated areas; however, direct mortality during the vegetation treatments is possible. Timing limitations (such as those for big game birthing areas, raptor nesting, and big game winter habitat), as well as site-specific COAs, could mitigate the short-term impacts resulting from the treatments.

ESR treatments following a wildfire are effective in restoring wildlife habitat. However, equipment is often noisy, and noise may alter animal behavior or cause wildlife to leave an area during the disturbance period. These impacts would be short-term and not likely to have much effect on the long-term health and habitat use of wildlife in the treatment area.

Alternative A would have the fewest restrictions for fuels management actions, with the most potential for vegetation disturbance. Additionally, Alternative A would not prioritize fire operations beyond what has already been determined in the fire management plans for the area; therefore, Alternative A would have the greatest impact on terrestrial wildlife.

Reclamation of sage-grouse habitats, in accordance to the Wyoming Reclamation Policy (BLM 2009a), could provide sufficient restoration of habitat following oil, gas, and other surface disturbing activities. If the policy is followed, prevention of erosion and the introduction of exotic or invasive plant species could be minimized. The landscape could be reclaimed to the original habitat components and structure to the extent possible. While the initial disturbance would result in habitat loss over the long term, sagebrush habitat could be restored; although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas.

Use of weed-free seed and mulch, desirable non-native species or sterile perennials, or reclaiming to native site plant composition for reclamation projects would reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Areas that restore with native plant composition provide habitat and cover for wildlife species and can support healthy wildlife populations.

Working with stakeholders to control grasshoppers and Mormon crickets could impact many wildlife species, particularly mammals, because un-controlled infestations of insects can reduce the amount of vegetation available for forage and cover. Impacts to wildlife from herbicide spraying can cause short-term wildlife displacement from vehicle use and human presence. Pesticide spraying can also cause short-term wildlife displacement and a loss of insects that could be a food source for birds, bats or other small mammals.

In the Rock Springs Field Office, management of wild horses to consider wildlife, watershed, and other resource needs could provide wildlife with adequate forage, habitat cover and water, all of which wild horses directly compete for with wildlife species. Water developments to improve herd distribution and manage forage utilization for wild horses could reduce pressure on areas where wildlife frequent and could cause wild horses to locate elsewhere.

Using wildfire for resource benefit can result in short-term impacts from habitat loss, habitat fragmentation, displacement of wildlife to less desirable, lower quality habitat, soil erosion, and sedimentation. Invasive, non-native plant species can become established in disturbed areas, which can alter native plant composition, reducing forage, and cover species for wildlife. When proper reclamation follows wildland fire use, strong, healthy native plant composition will return to burned areas, providing wildlife with preferred forage and cover vegetation. Rehabilitation for areas burned by wildland fires (Kemmerer, Newcastle and Rawlins) to prevent further resource damage could protect wildlife habitat from erosion and landslides that could result in habitat loss and runoff into riparian and aquatic ecosystems. Use of prescribed fire as a management tool can remove decadent or undesirable vegetation, promote new growth of fire-adapted plant species, or can be used for general fuels reduction in sensitive or at-risk areas. Prescribed fire can also introduce varied successional stages of plants within habitat areas. New growth and varied successional stages of vegetation provide wildlife with both forage and cover. Short-term impacts from prescribed fire are the same as described above for wildland fire use. Suppression techniques could impact wildlife in areas where they occur. Vegetation removal, crushing of habitat, the use of heavy equipment and fire retardant, and human presence could force wildlife from the area where these activities occurred to less desirable, lower quality habitat until these areas have recovered.

Using monitoring to ensure residual herbaceous vegetation is maintained for nesting cover in Greater Sage-Grouse habitat within Bates Hole and Fish Creek/Willow Creek areas would provide additional habitat for sagebrush obligate wildlife species.

Offsite mitigation for oil and gas development in the Pinedale Field Office could provide improvements to wildlife which inhabit those areas being mitigated. The initial mitigation projects could displace wildlife species from human and vehicle presence, causing wildlife to flee to other, possibly lower quality habitat. Displacement could cause short-term impacts from stress from fleeing or inadequate forage, shelter, or breeding habitat. Long term, wildlife could benefit from mitigation of habitat with increased forage, shelter, or breeding habitat.

Avoiding surface disturbing activities within 0.25 miles of occupied Greater Sage-Grouse leks in Casper (except for Bates Hole and Fish Creek/Willow Creek), Kemmerer, Newcastle, and Rock Springs Field Offices (93,580 total acres; Map 2-1) and prohibiting surface disturbing activities within 0.25 miles of occupied Greater Sage-Grouse leks in the Pinedale (in Traditional Leasing Areas and Unavailable Areas), Rawlins, and Rock Springs (Jack Morrow Hills area) field offices and TBNG (68,550 acres; Map 2-1) could prevent habitat loss or human presence within the buffered areas. The 0.25 mile area surrounding the lek could prevent habitat fragmentation and the impacts from surface disturbance, such as vegetation and habitat loss, soil loss and erosion, or the introduction of invasive, non-native plant species such as cheatgrass, which can alter the composition of native species for forage and cover for plants and wildlife.

Management in the Bates Hole and Fish Creek/Willow Creek areas of the Casper Field Office restricts or prohibits surface disturbing activity within 0.75 miles of occupied Greater Sage-Grouse leks. In areas with over 10% canopy cover, surface disturbing activities would be avoided within four miles of occupied Greater Sage-Grouse leks. The additional 0.5-mile distance from leks, as compared to the other areas under Alternative A, would allow for greater protection from surface disturbing activities, habitat loss, and reduction of contiguous habitat areas. The four-mile buffer in areas with over 10% canopy cover would

provide ideal habitat protection and connectivity and result in minimal disturbance to wildlife species within or nearby these areas.

Avoiding surface disturbing and disruptive activities in suitable sage-grouse nesting and early brood-rearing habitats within two miles of an occupied lek, or in identified sage-grouse nesting and early brood-rearing habitat outside the two-mile buffer from March 15 to July 15 in the Casper, Kemmerer, Newcastle, and Pinedale (Traditional Leasing Areas and Unavailable Areas) field offices would provide uninterrupted corridors for wildlife species. The buffer would provide contiguous habitat, and protect the area from human disturbance and disruptive activities which could prevent animal displacement or habitat abandonment. Rock Springs, including Jack Morrow Hills, follows a similar protocol as the other field offices; however, their restrictions are on a case-by-case basis.

Surface-disturbing and disruptive activities in Greater Sage-Grouse winter habitats would be avoided from November 15 to March 14 in the Casper, Kemmerer, and Newcastle Field Offices. In the Bates Hole and Fish Creek/Willow Creek area, winter habitat is closed to surface use (CSU) for surface disturbing activities in sagebrush stands of more than 20% canopy cover. For Pinedale, Rawlins, and Rock Springs Field Offices, winter protections occur within winter concentration areas. In Pinedale, Rawlins, and Jack Morrow Hills within the Rock Springs Field Office, the timing is also from November 15 to March 14. Within the remainder of the Rock Springs Field Office, restrictions are on a case-by-case basis. Winter habitat contains specific areas of sagebrush which rise 10-14 inches above the snow where Greater Sage-Grouse can feed on sagebrush leaves and buds (BLM 2009). Winter concentration areas are documented areas where large numbers (25 to 50 or more) of Greater Sage-Grouse consistently use habitat during the winter months and contain sagebrush as described for winter habitat (BLM 2009b). The management would provide wildlife within this habitat protection from noise, human disturbance, and habitat loss during the winter months. The impacts of human presence and disruptive activity on big game crucial winter range include loss of habitat and forage occurring from surface-disturbing activities at any time of the year, and displacement and physiological stress as a result of human presence and activity during the winter.

Minimizing impacts from predators could affect prey species such as sagebrush vole, cottontail rabbit, or gopher snake by reducing predation to the species. However, there could be effects to the predators (raven, coyote, and red fox) such as, in extreme cases, removal, and death.

Noise minimization could reduce disturbance to wildlife species (Kemmerer and Pinedale). Specific limitations such as limiting noise to 49 decibels (10 dBA above background noise) from March 1 to June 15 or within two miles of a Greater Sage-Grouse lek (TBNG) could prevent wildlife from abandoning habitat and moving to less desirable areas. Mule deer exhibit a stress response to disturbances associated with noise and activity up to 0.29 miles from the source (Freddy et al. 1986). Noise minimization can reduce stress responses, prevent a reduction in reproductive success, and prevent decreased immune response (Pater et al. 2009).

4.21.4 Alternative B

The following impacts apply to Alternatives B, C, and D and the Proposed LUP Amendments:

Implementing direct mitigation, utilizing BMPs and offsite compensatory mitigation would help maintain or improve sagebrush habitat and could minimize vegetation loss and soil erosion which would maintain or improve water quality. Maintaining or improving existing sagebrush habitat could provide consistent or increased forage and cover for terrestrial wildlife species. Utilizing LWG plans, analyses, and other sources of information to guide development of conservation objectives for local management of Greater Sage-Grouse habitats provides additional data and resources to aid in the protection and management of sagebrush habitat. These measures could protect or enhance sagebrush habitat where projects occur outside

of BLM lands, providing additional areas of habitat connectivity. This management would support wildlife species that use sagebrush habitat within and outside the planning area.

Application of appropriate seasonal restrictions when implementing vegetation management treatments for seasonal habitats in Greater Sage-Grouse priority habitat could provide wildlife with habitat improvements and could reduce disturbance of wildlife that use the habitat during the same season as Greater Sage-Grouse, such as pronghorn, mule deer, and bird species. Monitoring the treatments could provide feedback to whether the treatments were successful and if changes should be made in the approach to methods or timing in the area.

Ensuring site-specific, measurable, conservation and mitigation objectives are included in project planning within Greater Sage-Grouse habitats could help wildlife habitat recover after projects were completed and could assist in maintaining habitat and minimizing disturbance of wildlife during project development.

Developing landscape-scale restoration/conservation and maintenance strategies, including special management of seasonal habitats and connectivity zones outside of Greater Sage-Grouse core/priority habitat areas, with voluntary partners and cooperating agencies could protect uninterrupted expanses of sagebrush habitat, providing wildlife species with fewer disruptions of habitat. Improvements made to the habitat would benefit wildlife with improved forage and cover.

Using Integrated Vegetation Management per BLM Handbook H-1740-2 and Forest Service Manual 2080 and designing all range projects to minimize potential for invasive species establishment could help prevent the spread and inundation of invasive, non-native plant species. Invasive, non-native plant species can proliferate in disturbed areas and permanently damage native ecosystems if not prevented or quickly eradicated. Most wildlife rely on native plant species for food and cover; when invasive, non-native plant species replace native habitat, wildlife must relocate in search of desired habitat. If wildlife must travel any distance to relocate, their systems can become stressed, and if large numbers of wildlife are forced to leave an area due to lack of forage or cover, the relocation area may not be able to support all of the relocating wildlife and animals could be impacted by lack of forage. Monitoring and treating invasive species associated with existing range improvements could also prevent the establishment and spread of invasive, non-native plant species.

Applying RDFs (Appendix B) as mandatory stipulations/COAs within core/priority sage-grouse habitat for fluid minerals, travel management, lands and realty, range management, wild horses, solid minerals-coal, locatable minerals, West Nile virus, mineral materials, non-energy solid leasables, vegetation management, fire and fuels management, and noise where applicable, appropriate, and technically feasible, could ensure uninterrupted expanses of sagebrush habitat, providing wildlife species with fewer disruptions of habitat, improved forage and cover within Greater Sage-Grouse core/priority habitat areas.

Sagebrush habitat could be protected or improved where operators agree to implement additional conservation measures for their approved leases within Greater Sage-Grouse core/priority habitat. The degree and scale depends on which measures are implemented.

Incorporating new occupied Greater Sage-Grouse habitat into core areas for management as they are found would provide special management and protection to the wildlife habitat found within these areas. Continued ground-truth efforts for statewide Greater Sage-Grouse models could contribute data to provide more accuracy for the modeling effort. Using the sage-grouse Habitat Assessment Framework or best available assessment tool for evaluating Greater Sage-Grouse habitats would allow BLM or Forest Service wildlife biologists to survey for habitat value with the greatest accuracy and would provide rich data to support conservation, protection, and improvement of these habitats. Annual meetings and reviews of lek data with WGFD could provide continued communication and data transfer between agencies.

Working with proponents holding valid existing leases to provide additional protections to sagebrush habitat could reduce habitat loss and disturbance to sagebrush dependent wildlife species and could allow for contiguous, uninterrupted habitat. It is unknown, however, what level of long-term protection of habitat would occur, because the outcome is at each leaseholder's discretion. If leaseholders/project proponents agree to additional protections for their lease, there would be a reduction in additional habitat loss and fragmentation due to oil and gas development by protecting existing habitat resources from new development with buffer distances, additional reclamation, or seasonal closures. This would occur for all projects both inside and outside Greater Sage-Grouse priority habitat, which would allow for greater protections as habitat outside Greater Sage-Grouse priority habitat would be included.

Limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete and routes are either designated or closed within Greater Sage-Grouse core/priority habitat could limit impacts to wildlife from vehicle use. The miles of routes that could be limited cannot be determined until transportation planning is completed, but limiting new roads, routes, and cross-country travel until the planning occurs could prevent some disturbance to wildlife habitat. Cross country vehicle use can open up corridors that could be used by predatory animals, and additional vehicle traffic could use the pathway. Vehicles could cause mortality from crushing nesting birds or colliding with wildlife. Linear disturbances can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following vehicle passage.

Completing activity level travel plans within five years of the ROD would provide each BLM and Forest Service office the opportunity to address and analyze transportation routes that fragment Greater Sage-Grouse or other sensitive habitat. Designating routes during activity level planning in priority habitat with current administrative/agency purpose or need to administrative access only could reduce the level of road/route use. Reducing road/route use could decrease the level of disturbance from vehicle and human presence, or collisions with vehicles for wildlife. Assessing existing plans for consistency with Greater Sage-Grouse conservation objectives could allow the BLM and Forest Service to make changes to routes/roads that could reduce further impacts to wildlife and their habitat.

The construction of roads to minimum design standards needed for production activities within Greater Sage-Grouse core/priority habitat, in compliance with the DDCT, could reduce the amount of disturbance from road construction in some cases. Road construction can cause habitat and vegetation loss, erosion, sedimentation, and runoff. The spread of invasive, non-native plant species may also occur during or following road construction, which can further damage habitat. Human presence and vehicles may force wildlife species away from desired habitat to lower quality, less desirable habitat, creating additional stress for wildlife.

Working with project proponents in siting projects in locations containing the least sensitive habitats to minimize impacts to sensitive resources could reduce loss of higher quality habitat for wildlife that use or inhabit these areas and may allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects species from human and other disturbance. Disturbance can result in wildlife moving from high quality habitat to areas of lower quality, less desirable habitat. Abandonment of important habitat can lower reproduction and survival rates of the species and result in a decline in wildlife populations.

The following impacts apply only to Alternative B:

Under Alternative B, new transmission corridors would not be authorized within Greater Sage-Grouse priority and connectivity areas, which would prevent habitat loss from linear corridors within the area. Prohibiting new above-ground structures would also prevent new habitat loss, disturbance, or life-cycle disruption, all of which would protect wildlife and wildlife habitat. Maintenance and upgrades of existing structures could result in short-term disturbance of wildlife from human and vehicle activity, but long-term

impacts could be minimal. Linear disturbances can create barriers in migration corridors and fragmentation of habitat for wildlife. Disturbed corridors are desirable areas for predatory animals, such as raptors and fox; preventing the development of these areas may be beneficial to prey species but would also reduce hunting corridors for the predators. Preventing overhead structures in these areas could reduce the risk of predation from overhead predators, but also prevent the construction of overhead perches for predator hunting. The risk of collision or electrocution of bird and bat species could be reduced where overhead structures are not allowed. Maintenance and upgrades of existing structures could result in short-term disturbance of wildlife from human and vehicle activity, but long-term impacts would be minimal.

In priority Greater Sage-Grouse habitat, relocating existing designated ROW corridors void of authorized ROWs or undesignating the corridor could prevent future disturbance to wildlife and wildlife habitat from the construction of transmission lines or other linear ROW, as described above.

Under Alternative B, 5,271,440 acres would be managed as exclusion areas for new ROW/SUA permits, which could protect 4,985,510 more acres than in Alternative A. Avoidance areas would encompass 6,357,180 acres, 3,896,840 more acres than Alternative A. Impacts to wildlife habitat in these areas would be the same as Alternative A, although greater areas would be managed as exclusion and avoidance areas as compared to Alternative A. Co-locating ROWs or SUAs could reduce overall disturbance to new habitat; however, disturbance would still occur during development within the existing corridor. Wildlife that use early successional habitat could be impacted by development within existing corridor. Construction could result in vegetation loss and erosion. The spread of invasive, non-native plant species may also occur during or following construction. Human presence and vehicles may force wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur during construction. Corridors are desirable areas for predatory animals, such as raptors and fox, but these areas may be avoided by prey species which may move to less desirable habitat to avoid predation.

Removing, modifying or burying existing power lines, reclaiming linear features such as roads or fences, or removal of facilities and reclamation of well sites could provide benefits to wildlife species. Removing, modifying, or burying existing power lines could reduce the risk of collision or electrocution of bats, raptors, and other avian species. Prey species would be less likely to be subject to hunting from predatory bird species; however, predatory birds would no longer benefit from overhead hunting perches. Removal of fences reduces threats of injury or death from impacts to fences, opens up travel corridors, and could allow access to additional forage and cover. There would be short-term disturbance during reclamation and some initial habitat loss before vegetation returns. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. During reclamation, human and vehicle presence could cause species to vacate the area to lower quality habitat. Moving from desirable habitat can result in reduced health of animals, making them susceptible to disease or predation.

Under Alternative B, wind development in Greater Sage-Grouse priority habitat would be prohibited. In Greater Sage-Grouse general habitat, 127 turbines are projected to be developed, 1,127 fewer than under Alternative A. The development of wind energy outside of Greater Sage-Grouse priority habitat areas would cause habitat loss, and both short- and long-term impacts to habitat. Impacts from wind development in Greater Sage-Grouse general habitat would be the same as described under Alternative A, but for fewer numbers of turbines.

Restrictions on MET towers in Greater Sage-Grouse priority habitat could prevent impacts to smaller wildlife species by preventing the perching of raptors and removing collision obstacles for avian and bat species within sagebrush habitat to a greater degree than in Alternative A.

Retaining public ownership of Greater Sage-Grouse priority habitat would ensure that management within these areas would protect sagebrush habitat with all of the BMPs and other designations, which could provide habitat protection and contiguous habitat for wildlife which inhabit these areas, and would provide greater protections than Alternative A. Mitigation measures for land disposals with similar protections could provide habitat protection for sagebrush obligate species. Acquisitions or conservation easements (in lieu of acquisitions) could allow for additional management for Greater Sage-Grouse, providing habitat protection for sagebrush obligate species. Seeking to acquire state and private lands with intact subsurface mineral estate or BLM-administered lands or National Forest System lands that need subsurface mineral estate by donation, purchase, or exchange could allow for additional management for Greater Sage-Grouse, providing habitat protection for sagebrush obligate species such as sagebrush vole, pronghorn, or northern sagebrush lizard.

Not recommending withdrawal proposals not associated with mineral activity in Greater Sage-Grouse priority habitat unless the land management is consistent with Greater Sage-Grouse conservation measures could allow for additional management for Greater Sage-Grouse, providing habitat protection for sagebrush obligate species or other wildlife such as lark sparrow, gopher snake, and mule deer.

Incorporating a light grazing strategy utilizing 20-30% forage allocation for livestock in allotments not meeting standards in Greater Sage-Grouse priority habitat could allow habitat to restore for forage and cover for wildlife.

Working cooperatively on integrated ranch planning within Greater Sage-Grouse priority habitat could allow for coordinated planning between ranchers and federal agencies as single units, providing habitat protection for sagebrush obligate species or other wildlife, such as horned lark, black-tailed jackrabbit, and mule deer.

Impacts would be the same as Alternative A for management of rangelands, vegetation, and livestock grazing. In addition, Alternative B would require more stringent management from assessments to include indicators and measurements of structure, condition, and composition of vegetation specific to achieving sage-grouse habitat objectives; using sage-grouse habitat recommendations from Connelly et al. 2000b and Hagen et al. 2007, prioritizing completion of land health assessments, and using ESDs could provide additional forage and possible improvement of habitat features for wildlife species.

Reducing the procedures to retire grazing allotments could allow for more rapid release of lands back to wildlife use and to recover from the use of livestock, which could provide additional habitat and forage for wildlife.

Impacts to wildlife from conservation plan development to modify grazing management to meet seasonal Greater Sage-Grouse habitat requirements in Greater Sage-Grouse priority habitat would be the same as Alternative A.

Impacts to wildlife habitat from the retirement of grazing privileges would be the same as Alternative A, but could be applied to a larger area within Greater Sage-Grouse priority habitat. Identifying specific allotment(s) where permanent retirement of grazing privileges is potentially beneficial to Greater Sage-Grouse could lead to future availability of land, habitat, or forage for wildlife.

Impacts to wildlife habitat from management for drought and other conditions in livestock allotments would be the same as Alternative A. Additional priority for Greater Sage-Grouse habitat during periods of drought could also be beneficial to wildlife which also use sagebrush habitat for forage of cover.

Impacts to wildlife habitat from range improvement projects would be the same as Alternative A. In addition, designing any new structural range improvements and location of supplements (salt or protein blocks) to conserve, enhance, or restore Greater Sage-Grouse habitat through an improved grazing management system relative to Greater Sage-Grouse objectives and other considerations for range improvements within Greater Sage-Grouse priority habitat could also be beneficial to wildlife that use sagebrush habitat for forage cover. Requiring Greater Sage-Grouse safe fence design could reduce impacts to wildlife from collisions. Perch inhibitors for raptors could prevent prey species from hunting from predatory bird species; however, predatory birds would not benefit from overhead hunting perches.

Impacts to wildlife and fisheries habitat from management of riparian, springs, and seep areas would be the same as Alternative A. Additional management to reduce hot season grazing and for edge habitat in wet meadows could provide wildlife with improved habitat conditions during hot weather within riparian areas.

Impacts to wildlife habitat from water development would be the same as Alternative A; however, implementing development only where it would either benefit or have neutral impacts to Greater Sage-Grouse habitat could benefit wildlife habitat.

Not allowing any exceptions to lease stipulations, COAs, and T&Cs could prevent additional surface disturbing activities in Greater Sage-Grouse habitat which reduces disturbance from roads, structures, power lines, and human activity and could allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat supports migration corridors, provides forage or hunting areas (in the case of predators), and can also protect wildlife from human and other disturbance.

Closing Greater Sage-Grouse priority habitat areas to fluid mineral leasing (6,886,890 acres) would reduce habitat loss for wildlife and would allow for contiguous, uninterrupted habitat, and would close 6,015,110 more acres than Alternative A. Contiguous, uninterrupted habitat protects wildlife from human and other disturbance and is necessary for wildlife to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity. Allowing exceptions to the closure where Greater Sage-Grouse are shown to not be impacted could have impacts to wildlife species as described under Alternative A. Under Alternative B, 2,117,160 acres would be managed with NSO stipulations, which is 2,076,180 more acres than Alternative A.

Oil, gas, and CBNG leasing and development would still be available outside of Greater Sage-Grouse priority habitat. Impacts from exploration and development activities would be the same as described under Alternative A for oil and gas development; however, 13,709 wells are predicted to be developed outside of Greater Sage-Grouse priority habitat under Alternative B, 2,702 fewer wells as compared to Alternative A. Under Alternative B, only 33,530 acres of short-term disturbance would occur, 5,520 fewer acres than Alternative A, and 104,050 acres of long-term disturbance would remain under Alternative B, 26,280 acres fewer than Alternative A. The lower number of acres disturbed by oil and gas development would provide even greater protections to wildlife habitat as compared to Alternative A.

Impacts from geophysical exploration on wildlife would be the same as Alternative A. Some impacts to wildlife could be reduced by using helicopter-portable drilling or wheeled or tracked vehicles on existing roads in accordance with seasonal timing limitations and other restrictions that may apply. Using helicopters or existing roads for geophysical exploration could reduce linear disturbances to vegetation created by vibroseis, thereby preventing impacts to wildlife habitat from vegetation damage or loss and interruption of habitat and migration corridors.

Impacts to wildlife habitat from offsite mitigation would be the same as Alternative A. In addition, applying COAs, mitigating or reducing the impact to Greater Sage-Grouse priority habitat during lease development would reduce habitat loss for wildlife and would allow for contiguous, uninterrupted habitat. Contiguous, uninterrupted habitat protects wildlife from human and other disturbance and is necessary for wildlife to breed, migrate, forage, seek cover, and complete their life histories. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future leases could occur under the other action alternatives.

Working with proponents holding valid existing leases to promote measurable Greater Sage-Grouse conservation objectives could reduce habitat loss and disturbance to sagebrush dependent wildlife species and could allow for contiguous, uninterrupted habitat. It is unknown, however, what level of long-term protection of habitat would occur, because the outcome is at each leaseholder's discretion. If leaseholders/project proponents agree to additional protections for their lease, there would be a reduction in additional habitat loss and fragmentation due to oil and gas development by protecting existing habitat resources from new development with buffer distances, additional reclamation, or seasonal closures. This would occur for all projects both inside and outside Greater Sage-Grouse priority habitat, which would allow for greater protections, as habitat outside Greater Sage-Grouse priority habitat would be included.

Working with project proponents in siting projects to promote measurable Greater Sage-Grouse conservation objectives would impact wildlife the same as Alternative A. In addition, requiring development within priority habitat to be placed in the area least harmful to Greater Sage-Grouse based on vegetation, topography, or other habitat features could benefit wildlife species which use Greater Sage-Grouse habitat, such as pronghorn, sagebrush vole, and horned lark.

Not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat to oil and gas leasing (2,082,140 acres) could reduce habitat loss for wildlife and would allow for contiguous, uninterrupted habitat. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A. While a four-mile buffer around a lek could reduce or prevent impacts to wildlife from noise, human and vehicle presence, and drilling activities in the buffer area, wildlife habitat could be still impacted from oil and gas development by surface disturbance, habitat loss, erosion, and the spread of invasive, non-native plant species. Surface disturbance also disrupts contiguous habitat, which can inhibit wildlife travel and migration patterns, and could lead to reduced health and reproductive success in some wildlife species.

Completing Master Development Plans during planning and review of projects involving multiple proposed disturbances within a lease or priority habitat area, without an exception for individual wildcat (exploratory) wells, could provide fewer impacts to wildlife from surface disturbance from consolidated planning of infrastructure within the development area.

Requiring unitization within Greater Sage-Grouse priority habitat when deemed necessary for proper development and operation of an area (with strong oversight and monitoring) could consolidate development and infrastructure, reducing impacts to wildlife and habitat from surface disturbing activities (Marranzino et al. 2011).

Requiring full reclamation bonds sufficient to restore lands to prior disturbance conditions (Connelly et al. 2000, Hagen et al. 2007) could provide wildlife with complete habitat improvement and recovery in areas disturbed by oil, gas and other surface disturbing activities if project abandonment occurs. Full restoration of habitat could benefit wildlife with native forage and cover depending on the habitat being restored.

Impacts to wildlife habitat from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative A, but on a larger scale for the entire planning area.

Impacts to wildlife habitat from coal leasing in lands outside of priority Greater Sage-Grouse habitat would be the same as Alternative A. In addition, finding Greater Sage-Grouse priority habitat unsuitable to all surface mining of coal under the criteria set forth in 43 CFR 3461.5 would prevent surface disturbance, habitat loss or damage, soil runoff, erosion, and the introduction or spread of invasive, non-native plant species. Impacts such as displacement of wildlife from surface mining activities, avoidance of the area around the development because of human and vehicle presence and noise forcing wildlife to move from high quality habitat to areas of lower quality, less desirable habitat could be avoided if surface mining for coal was found unsuitable.

Granting no new underground mining leases unless all surface disturbances (appurtenant facilities) are placed outside of the Greater Sage-Grouse priority habitat area would reduce surface disturbance within Greater Sage-Grouse priority habitat, creating a smaller amount of forage and habitat loss compared to Alternative A. Human presence and vehicle use to access the mine could cause displacement of wildlife from vehicles and noise, avoidance of a larger area around the development because of human presence, vehicles and noise, and possible collisions from vehicles. Vehicle routes are prone to use by predators, which would benefit predators (raptors, coyote, red fox, raven) but could impact prey species (cottontail rabbit, wandering garter snake, and northern sagebrush lizard) from predation.

Allowing appurtenant facilities by co-locating them or building facilities to minimum standards could result in surface disturbance or habitat loss, soil loss or sedimentation, and the introduction or spread of invasive, non-native plant species. The management could reduce overall disturbance to new habitat; however, disturbance could occur within an existing corridor. Wildlife that use early successional habitat could be impacted by development within an existing corridor. Noise, human presence, vehicle use, and linear disturbances can cause wildlife to move to lower quality habitat, less desirable forage and cover during and following construction activities.

Not allowing coal exploration in Greater Sage-Grouse priority habitat would prevent the impacts described under Alternative A.

Closing Greater Sage-Grouse priority habitat to non-energy leasable mineral leasing (5,000,400 acres) would prevent the impacts described under Alternative A.

If all lands recommended for withdrawal from mineral entry within Greater Sage-Grouse priority habitat were withdrawn (5,118,070 acres), 5,044,800 more acres of wildlife habitat could be protected from disturbance and habitat loss as compared to Alternative A. Additional mitigation, seasonal restrictions, or making withdrawal areas subject to validity exams or buy out could reduce further habitat disturbance or damage, or in some cases, improvement in habitat.

Under Alternative B, 6,992,690 acres would be closed to mineral material sales, exploration, and free use permits, 6,519,890 more acres as compared to Alternative A. Wildlife and their habitat within these areas would not be impacted by displacement from exploration or pit areas, abandoning habitat within the area

around the development because of human presence and noise, and possible offsite impacts, including erosion, and spread of invasive, non-native plant species.

Restoring salable mineral pits within Greater Sage-Grouse priority habitat could cause short-term impacts to wildlife and wildlife habitat from restoration activities by human and vehicle presence, noise, or surface disturbance and runoff; however, restoring habitat for wildlife could have long-term beneficial impacts from additional forage and cover, especially for wildlife that use sagebrush habitat.

Allowing BLM SRPs and Forest Service RSUAs in Greater Sage-Grouse priority habitat that have neutral or beneficial effects to priority habitat areas, could reduce the impacts to wildlife and wildlife habitat from recreational activities and human presence as compared to Alternative A.

Greater Sage-Grouse priority habitat areas would be designated as Greater Sage-Grouse conservation ACECs/SIA, 5,000,400 acres. Wildlife and fisheries habitat would receive the benefits of management under an ACEC/SIA. This management would be focused on the protection of Greater Sage-Grouse habitat, which would also benefit wildlife, especially those which use sagebrush and associated habitat.

Designating all OHV "open" areas within Greater Sage-Grouse priority habitat areas as limited to designated roads and trails (not including the sand dune portions of these areas) could prevent damage to wildlife habitat from off road vehicle use. Off road, open OHV use in areas outside of the dunes can degrade vegetation and lead to erosion and habitat loss, reduced quality of habitat, and the introduction and spread of invasive, non-native plants that can further degrade habitat quality and change habitat composition. Designating use as limited to roads and trails could reduce these impacts to wildlife habitat. The remaining open areas are sand dunes which are not desired habitat for most wildlife species. Because these are existing use areas, it is likely that most wildlife have already abandoned use or avoid the area.

Limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative A. Completing activity level travel plans within five years of the ROD would provide each BLM and Forest Service office the opportunity to address and analyze transportation routes that fragment Greater Sage-Grouse or other sensitive habitat. Designating routes during activity level planning in priority habitat with current administrative/agency purpose or need to administrative access only could reduce the level of road/route use. Reducing road/route use could decrease the level of disturbance from vehicle and human presence or collisions with vehicles for wildlife. Assessing existing plans for consistency with Greater Sage-Grouse conservation objectives could allow the BLM and Forest Service to make changes to routes/roads that could reduce further impacts to wildlife and wildlife habitat.

Not upgrading existing routes could reduce surface disturbance from upgrading activities, preventing vegetation and soil loss, sedimentation, and possible displacement of wildlife from human and vehicle presence. Any exceptions resulting in road upgrades could further fragment habitat, cause vegetation loss, erosion, and the spread of invasive, non-native plant species. Human presence and vehicles may force wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat.

Using existing roads to access valid existing rights could prevent vegetation and soil loss, sedimentation, noise, and human, vehicle and construction equipment that are associated with road construction. New road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Human presence and vehicles may force wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals, such as raptors and foxes, but these areas may be avoided by prey species which may move to less desirable habitat to

avoid predation. All of these impacts could be avoided by using existing roads. Increased use of roads during lease development could occur, which could increase impacts to wildlife from collisions with vehicles. If new roads were necessary, impacts to wildlife and habitat described above could apply. Mitigation could provide new habitat where habitat was lost during construction, but impacts from roads and construction would still affect wildlife.

Restoring roads or trails not designated in travel management plans within Greater Sage-Grouse priority habitat could provide fewer disturbances from occasional vehicle or human presence and could improve sagebrush habitat conditions by removing linear disturbances, allowing for greater habitat connectivity, and providing additional vegetation resources for forage or cover. Vehicle routes are prone to use by predators (raptors, coyote, red fox, raven). Prey species (cottontail rabbit, wandering garter snake, northern sagebrush lizard) could benefit from the rehabilitation of unused roads or trails, which could reduce the presence of predatory animals; although predatory wildlife could lose hunting habitat as roads and routes are reclaimed.

Impacts to wildlife from use appropriate seed mixes and transplanted sagebrush for reseeding roads, primitive roads, and trails within Greater Sage-Grouse priority habitat would be the same as Alternative A.

Managing for vegetation composition and structure consistent with ecological site potential and within the reference state to achieve Greater Sage-Grouse seasonal habitat objectives within Greater Sage-Grouse priority habitat could provide sagebrush obligate wildlife habitat, forage, and cover within these areas. Initial treatments could cause short-term impacts from displacement from human and vehicle activities which could move animals into less desirable habitat and could increase competition for available resources with other species and uses. Using ESD potential in Greater Sage-Grouse habitat to help protect against invasive, non-native plants could prevent the introduction and spread of invasive, non-native plant species that can alter or degrade the native landscape and force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat.

Designing and limiting treatments within sagebrush habitat not to reduce sagebrush canopy cover to less than 15% could prevent habitat fragmentation and provide varied vegetation structure within the greater habitat area, the same as Alternative A. Limiting prescribed burns to specific canopy cover, vegetation composition, patch size, or amount of precipitation within sagebrush habitat could cause vegetation treatments to be maximized for the conditions and habitat structure. Wildlife could benefit from carefully managed prescribed burn treatments as described above. Fuel breaks can provide barriers to wildland fires or contain prescribed fire. While fuel breaks remove vegetation, habitat and create linear disturbances, without them, catastrophic fires could occur, destroying habitat, and leaving areas of disturbance. Considering the use of fuel breaks in NEPA documents could allow decision-makers to make an informed decision on the best course of action for each location.

In Greater Sage-Grouse priority habitat, allowing treatments that conserve, enhance, or restore Greater Sage-Grouse habitat could provide sagebrush obligate wildlife habitat, forage, and cover within these areas. Initial treatments could cause displacement from human and vehicle activities which could move animals into less desirable habitat and could increase competition for available resources with other species and uses.

Not allowing treatments in known Greater Sage-Grouse winter range with the exception to strategically reduce wildland fire risk could protect habitat components to sagebrush obligate species, especially those who use winter habitat such as sagebrush vole and pronghorn.

Impacts to wildlife habitat from resting treated areas from livestock grazing for two years after prescribed burns would be the same as Alternative A, although it would apply to the entire planning area.

Impacts to wildlife habitat from reclamation of Greater Sage-Grouse habitat in accordance to the Wyoming Reclamation Policy (BLM 2009a) would be the same as Alternative A.

Where restoration of Greater Sage-Grouse priority habitat occurs, the use of native seeds or other non-native seeds to meet Greater Sage-Grouse habitat objectives, re-establish sagebrush cover and desirable understory plants, restore native plants, and create landscape patterns that most benefit Greater Sage-Grouse would provide habitat and forage for sagebrush obligate and other wildlife species. Attempting to use native seeds not only provides wildlife with ideal forage and cover, it also can prevent the introduction and spread of invasive, non-native plant species that can alter habitat and render it unusable to wildlife. While the initial disturbance would result in habitat loss, over the long-term, sagebrush habitat could be restored, although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Prioritizing areas for restoration could benefit wildlife that use those areas which are restored.

Prioritizing native seed allocation for use in Greater Sage-Grouse habitat in years when preferred native seed is in short supply for ES&R (BLM) and/or BAER (Forest Service) projects is required and could reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Areas that restore with native plant composition provide habitat and cover for wildlife species and can support healthy wildlife populations. Managing post ES&R and BAER areas to ensure long-term persistence of seeded or pre-burn native plants using temporary or long-term changes in livestock grazing, wild horse, and travel management, etc. could allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding pressure from grazing or other activities. Changing management in restored areas could provide wildlife with new vegetation for forage without competition or disturbance from other resource uses.

Altering existing seedings where appropriate to benefit Greater Sage-Grouse could also benefit sagebrush obligate wildlife such as pronghorn, northern sagebrush lizard, and sagebrush vole, but could impact other wildlife that are using the existing seedings from habitat loss. Short-term impacts to wildlife and wildlife habitat could occur from restoration activities by human and vehicle presence, noise, or surface disturbance and runoff, but the long-term impacts would benefit the wildlife that would use the restored habitat. Giving priority for implementing specific sage-grouse habitat restoration projects could impact wildlife similarly as the actions above. Wildlife using grassland habitat, such as mule deer, western meadowlark, and rough-legged hawk could be displaced as the habitat is converted, possibly to lower quality habitat or areas with more competition for resources. Alternative B would prioritize fire operations in priority habitat, immediately after life and property; therefore, the potential for disturbance to terrestrial wildlife within these habitats is lower under Alternative B than Alternative A.

Establishing seed harvest areas that are managed for seed production for fire prone areas could ensure that seed is available for habitat restoration, providing habitat for sagebrush obligate wildlife or other wildlife species.

Ensuring that grasshopper and Mormon cricket control could only occur in Greater Sage-Grouse priority habitat where it can be demonstrated that it is beneficial to Greater Sage-Grouse would reduce the impacts described under Alternative A.

Impacts from the management of wild horses with the consideration of Greater Sage-Grouse populations within priority habitat could benefit wildlife habitat. Conducting land health assessments in all BLM HMAs and Forest Service WHTs within Greater Sage-Grouse priority habitat could identify where habitat improvements could occur. Wild horses directly compete with wildlife species for forage, habitat, cover, and water. Any management that could improve habitat for Greater Sage-Grouse could also benefit wildlife,

especially those who are sagebrush obligate or those who use sagebrush for some part of their life cycle. Management of wild horses to consider wildlife, watershed, and other resource needs could provide wildlife with adequate forage, habitat cover and water, all of which wild horses directly compete for with wildlife species. Water developments to improve herd distribution and manage forage utilization for wild horses could reduce pressure on areas where wildlife frequent and disperse wild horses elsewhere.

Designing and implementing fuels treatments with an emphasis on protecting existing sagebrush ecosystems in Greater Sage-Grouse priority habitat could have short and long-term impacts to wildlife habitat. The emphasis on protecting sagebrush ecosystems could protect sagebrush obligate habitat, forage, and cover within these areas. Impacts to wildlife from rehabilitation for areas burned by wildland fires would be the same as Alternative A, but would apply to the Greater Sage-Grouse priority habitat area and could receive additional recovery effort.

Impacts to wildlife from the use of prescribed fire would be the same as Alternative A, but would apply to the entire Greater Sage-Grouse priority habitat area. The additional restriction to precipitation level could prevent long-term habitat loss from the use of fire in areas where the lack of rainfall makes revegetation and restoration prohibitive. Cheatgrass can also quickly recover from fire, and could continue to spread and out-compete native grasses, altering native habitat and creating monocultures.

Managing post-fuels management areas to ensure long-term persistence of seeded or pre-burn native plants using temporary or long-term changes in livestock grazing management, wild horse management, and travel management, etc. could allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding pressure from grazing or other activities. Changing management in restored areas could provide wildlife with new vegetation for forage without competition or disturbance from other resource uses.

Impacts to wildlife using wildland fire, prescribed fire, and fire suppression techniques would be the same as Alternative A.

Suppressing wildfires as quickly and safely as possible in Greater Sage-Grouse priority habitat could prevent the loss of sagebrush habitat for wildlife species that use these areas. Fire suppression techniques could impact nearby wildlife in areas where they occur. Vegetation removal, crushing of habitat, the use of heavy equipment and fire retardant, and human presence could force wildlife from the area where these activities occurred to less desirable, lower quality habitat until these areas have recovered.

The use of monitoring plans could provide benefits to wildlife within Greater Sage-Grouse priority habitat by studying the effectiveness of conservation efforts for Greater Sage-Grouse by either confirming that habitat is being improved or that current management is not meeting the objectives laid out in their projects. If Greater Sage-Grouse habitat is meeting objectives, then wildlife could be benefitting from the habitat as well. If the habitat is not meeting objectives, wildlife could be impacted, and through monitoring, improvements could be made which then could provide habitat benefits to wildlife. Making improvements could provide overall improvements in landscape health, prevent or reduce the spread of invasive, non-native plant species, provide additional forage, and allow for greater cover habitat for wildlife.

Wildlife species are sensitive to density of disturbance as well as to proximity. Under Alternative B, management would not allow discrete anthropogenic disturbances to cover more than 3% of the total sage-grouse habitat regardless of ownership within Greater Sage-Grouse priority habitat. The density of disruptive activities under Alternative B for Greater Sage-Grouse priority habitat would provide the lowest density of disturbance of habitat. If Alternative B were applied, wildlife could be affected by lower losses of habitat as compared to Alternative A. This alternative could provide for more contiguous, uninterrupted habitat. Development of anthropogenic features can result in noise, human presence, vehicle use, vegetation

loss, and the introduction and spread of invasive, non-native plant species which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Capping disturbance from roads, structures, power lines, drilling operations, and human disturbance could remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur.

Using mitigation to restore habitat to maintain the 3% disturbance limit could be effective for rehabilitating wildlife habitat and continuing to provide contiguous uninterrupted habitat with minimal disturbance.

Not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority and connectivity habitat to oil and gas leasing (2,082,140 acres) could reduce habitat loss for wildlife and would allow for contiguous, uninterrupted habitat. Oil and gas exploration and development can result in noise, human presence, vehicle use, vegetation loss, introduction and spread of invasive, non-native plant species which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future surface disturbance could occur under Alternative A. A four-mile buffer around leks could reduce or prevent impacts to wildlife from disturbance from noise, human and vehicle presence, and drilling activities; however, wildlife habitat could be impacted from oil and gas development by surface disturbance, habitat loss, erosion, and the spread of invasive, non-native plant species. Surface disturbance also causes barriers in contiguous habitat, which can disrupt wildlife travel and migration patterns and could lead to reduced health and reproductive success in some wildlife species.

Applying a restriction on exploratory drilling that prohibits surface disturbing activity during nesting and early brood-rearing season in Greater Sage-Grouse priority habitat could protect the habitat identified as suitable and the wildlife species which use or occur within the identified area. This management could allow for fewer disturbances to wildlife from noise, human presence, vehicle use, vegetation loss, and introduction and spread of invasive, non-native plant species which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat.

Not allowing new surface occupancy on federal leases in Greater Sage-Grouse winter concentration areas within Greater Sage-Grouse priority habitats during any time of the year could prevent impacts to wildlife from surface disturbance, habitat loss, erosion, and the spread of invasive, non-native plant species. Preventing surface disturbance could reduce barriers in contiguous habitat, preventing disruptions in wildlife travel and migration patterns, and could provide wildlife continued health and reproductive success, especially for those species which use winter concentration habitat such as sagebrush vole, mule deer, and pronghorn.

Limitations on noise would have similar impacts on wildlife but on a larger scale, covering the entire planning area, as compared to Alternative A.

The use of adaptive management strategies in support of the population management objectives for Greater Sage-Grouse set by the State of Wyoming (WY EO 2011-05) could provide wildlife additional habitat protection though additional management for Greater Sage-Grouse and sagebrush habitat.

4.21.5 Alternative C

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

Impacts to wildlife habitat from relocating existing designated ROW corridors would be the same as Alternative B.

Impacts to wildlife from management of priority and general Greater Sage-Grouse habitat as ROW exclusion areas would be the same as Alternative A but it would protect 11,556,490 acres, all as exclusion areas, 11,270,560 more acres than under Alternative A.

Amending ROWs to require features that enhance Greater Sage-Grouse habitat security (protective features) would be the same as Alternative A, but would apply to a greater area, providing more protection to wildlife. Maintenance and upgrades of existing structures in BLM ACECs and Forest Service Special Areas could result in short-term disturbance of wildlife from human and vehicle activity, but long-term impacts would be minimal.

Under Alternative C, wind development in Greater Sage-Grouse priority and general habitat would be prohibited. Closing 11,531,340 acres to wind energy development would protect wildlife habitat from surface disturbance, habitat loss, disturbance from human presence and activity, new road construction, the spread of invasive, non-native plant species, and the threats of collision mortality of birds and bats.

Under Alternative C, it is estimated that 127 wind turbines would be developed. If wind development was allowed to occur (wind development in Greater Sage-Grouse priority and general habitat would be prohibited), locating wind energy development at least five miles from active Greater Sage-Grouse leks could reduce disturbance to wildlife species which use lek habitat such as pronghorn, mule deer, or sagebrush vole. Restrictions on MET towers would have the same impacts to wildlife as in Alternative A.

Prohibiting industrial solar projects in ACECs and occupied Greater Sage-Grouse habitat would prevent the impacts to thousands of acres of wildlife habitat from vegetation removal, habitat loss, increased runoff and erosion, displacement, and the loss of contiguous, uninterrupted habitat.

Retaining public ownership of Greater Sage-Grouse priority habitat would ensure that management within these areas would protect sagebrush habitat with all of the BMPs and other designations, which could provide habitat protection for wildlife that inhabit these areas, and would provide greater protections than Alternative A. Impacts to wildlife would be the same as Alternative B.

Impacts to wildlife from acquisitions or conservation easements and acquiring private lands would be the same as Alternative B.

Impacts to wildlife from not approving recommended withdrawal proposals unless the land management is consistent with Greater Sage-Grouse conservation measures could provide greater protection to sagebrush habitat and could provide habitat protection for wildlife that inhabit these areas, and could provide greater protections to functional habitat than Alternative A.

Prohibiting livestock grazing within Greater Sage-Grouse priority habitat (5,000,400 acres) would provide the greatest availability of habitat and forage for wildlife as compared to Alternative A, completely removing competition for resources with livestock.

Impacts would be the same as Alternative A for management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands, although it would occur only on Greater Sage-Grouse general habitat. In addition, Alternative C includes additional management for Greater Sage-Grouse general habitat by providing healthy, resilient, and recovering habitat components which could give sagebrush obligate and other wildlife species additional habitat and forage within these areas.

Using ESD potential in Greater Sage-Grouse habitat to help protect against invasive, non-native plants could prevent the introduction and spread of invasive, non-native plant species which can alter or degrade the native landscape and force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. In areas without ESDs, wildlife habitat could benefit from the use of reference sites to identify appropriate vegetation communities and soil cover.

Impacts to wildlife habitat from reducing the procedures to retire grazing allotments would be the same as Alternative B. Impacts to wildlife habitat from the retirement of grazing privileges would be the same as Alternative A. Identifying specific allotment(s) where permanent retirement of grazing privileges is potentially beneficial to Greater Sage-Grouse would be the same as Alternative B.

Impacts to wildlife habitat from management for drought and other conditions in livestock allotments would be the same as Alternative A. Additional priority for Greater Sage-Grouse habitat during periods of drought could also be beneficial to wildlife which also use sagebrush habitat for forage of cover and would include a larger area of habitat than under Alternative B (priority and general Greater Sage-Grouse habitat).

Impacts to wildlife habitat from range improvement projects would be the same as Alternative B, but would only apply to Greater Sage-Grouse general habitat.

Impacts to wildlife habitat from current livestock trailing practices would be the same as Alternative A; in addition, avoiding grazing and trailing within lekking, nesting, brood-rearing, and winter habitats during periods of the year when these habitats are utilized by Greater Sage-Grouse could affect wildlife habitat by protecting it from the impacts described in Alternative A: loss of vegetation for forage and cover, soil compaction, erosion, trampling of vegetation and habitat, and the spread of invasive non-native plant species.

Impacts to wildlife habitat from riparian habitat management in Greater Sage-Grouse priority habitat would be the same as Alternatives A and B. In addition, Alternative C would provide additional habitat for wildlife species with the requirement of at least six inches stubble height. This management could affect aquatic, riparian or wetland habitat by preventing streambank erosion or channel alteration, sedimentation, habitat loss, or the spread of invasive, non-native plant species (University of Idaho Stubble Height Review Team 2004). Hot season livestock grazing would not apply under Alternative C.

Impacts to wildlife habitat from water developments would be the same as Alternative A. In addition, not authorizing new water developments could affect wildlife habitat by not providing additional developed water sources and could protect sensitive spring and seep habitat from trampling from wildlife or livestock (in general habitat) surrounding the water development and the spread of invasive non-native plant species.

Impacts to wildlife habitat from modifying springs, seeps, and associated water developments to maintain the continuity of the pre-development riparian area within sage-grouse habitats would be the same as Alternative B. In addition, dismantling water developments could affect wildlife habitat by removing additional developed water sources and could protect sensitive spring and seep habitat from trampling from wildlife or livestock surrounding the water development.

Impacts to wildlife habitat from not allowing any exceptions to lease stipulations, COAs, and T&Cs in Greater Sage-Grouse priority habitat would be the same as Alternative B, but would include Greater Sage-Grouse general habitat to affect more of the planning area.

Maximizing the avoidance of impacts from oil, gas, or geothermal activity could reduce habitat loss for wildlife and would allow for contiguous, uninterrupted habitat. Oil, gas and geothermal exploration and development can result in noise, human presence, vehicle use, vegetation loss, and the introduction and

spread of invasive, non-native plant species, which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Removing disturbance from roads, structures, power lines, drilling operations, and human disturbance from oil and gas development would remove a majority of stressors and disruption of habitat and would allow for continued habitat connectivity in areas where future leases could occur under the other action alternatives.

Closing Greater Sage-Grouse priority and general habitat areas to fluid mineral leasing (16,878,220 acres) would reduce habitat loss for wildlife and would allow for contiguous, uninterrupted habitat, and would close 16,006,440 more acres than Alternative A. Impacts to wildlife habitat would be the same as described under Alternative B. Under Alternative C, 11,126 wells are predicted to be developed, 5,284 fewer wells as compared to Alternative A. This alternative would allow for the greatest number of acres to be protected from habitat loss due to oil and gas development and could provide the largest protection of wildlife habitat as compared to Alternative A.

Not issuing new geophysical exploration permits within priority and general Greater Sage-Grouse habitat would prevent impacts to wildlife associated with geophysical operations in the entire planning area. Allowing exceptions for geophysical exploration would impact wildlife the same as described under Alternative A.

Impacts to wildlife habitat from offsite mitigation would be the same as Alternative A. Applying COAs, mitigating or reducing the impact to Greater Sage-Grouse priority habitat during lease development would have impacts the same as described under Alternative B.

Impacts to wildlife habitat from not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat would be the same as Alternative B. Impacts to wildlife habitat from completing Master Development Plans and requiring unitization within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to wildlife habitat from requiring full reclamation bonds would be the same as Alternative B.

Prohibiting the construction of evaporation or infiltration reservoirs to hold coalbed methane wastewater would provide wildlife greater protection as compared to Alternative A. Not allowing construction of reservoirs could prevent impacts to wildlife from contact with highly alkaline wastewater with very high concentrations of salt (USFWS 2006b). Alternative C would remove the impacts from waterfowl entering the ponds, accumulating high concentrations of salt in their feathers, and causing them to drown from the excess weight or by ingesting wastewater and having salts could accumulate in their tissues, causing damage if toxic levels built up.

Impacts to wildlife habitat from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative B.

Exploring options to amend, cancel, or buy out leases in ACECs and Greater Sage-Grouse priority and general habitat would not have any impacts to wildlife habitat until leases were amended, canceled, or bought out.

Impacts to wildlife habitat from coal leasing in lands outside of priority Greater Sage-Grouse habitat would be the same as Alternative B. Impacts to wildlife habitat from granting no new underground mining leases unless all surface disturbances (appurtenant facilities) are placed outside of the priority Greater Sage-Grouse habitat would be the same as Alternative B.

Impacts to wildlife habitat if all lands recommended for withdrawal from mineral entry within Greater Sage-Grouse priority habitat were withdrawn would be the same as Alternative B. Impacts to wildlife habitat from 6,992,690 acres being closed to mineral material sales, exploration, and free use permits would be the same as Alternative B. Impacts to wildlife habitat from restoring salable mineral pits within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to wildlife habitat from allowing BLM SRPs and Forest Service RSUAs in priority Greater Sage-Grouse habitat would be the same as Alternative B.

Seasonally prohibiting camping and other non-motorized recreation within four miles of active Greater Sage-Grouse leks could protect wildlife within the buffer area from impacts of recreation use, such as displacement of wildlife from human and vehicle activities, damage or loss of habitat, spread of invasive, non-native plant species and alteration of some habitat components from the presence of invasive plant species, or physiological stress from human presence during sensitive life stages.

Under Alternative C, approximately 6,423,370 acres of Greater Sage-Grouse priority habitat areas and Audubon Important Bird Areas would be designated as Greater Sage-Grouse conservation ACECs/SIAs. Impacts from this management would be the same as Alternative B.

Impacts to wildlife habitat from designating all OHV "open" areas within Greater Sage-Grouse priority habitat areas as limited to designated roads and trails (not including the sand dune portions of these areas) would be the same as Alternative B.

Impacts to wildlife habitat from limiting motorized travel to existing roads, primitive roads, and trails at a minimum, until such time as travel management planning is complete, would be the same as Alternative B.

Prohibiting new road construction within four miles of the perimeter of active Greater Sage-Grouse leks would provide buffer distances for wildlife that use lek or sagebrush habitat from the presence of roads and the impacts of road construction. Road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Human presence and vehicles may force wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals, such as raptors and coyote, but these areas may be avoided by prey species which may move to less desirable habitat to avoid predation. Avoiding new road construction in Greater Sage-Grouse priority and general habitat would impact wildlife as described above where roads were not constructed.

Impacts to wildlife habitat from not upgrading existing routes in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area.

Impacts to wildlife habitat from limiting route construction to realignments of existing routes in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area, 11,531,340 acres. In addition, mitigating any impacts to keep disturbance within 3% with methods that have been demonstrated to be effective to offset the loss of Greater Sage-Grouse habitat could benefit sagebrush obligate wildlife from additional loss of habitat, forage, and cover within these areas.

Impacts to wildlife habitat from restoring roads or trails not designated in travel management plans within priority Greater Sage-Grouse habitat would be the same as Alternative B.

Impacts to wildlife habitat from reseeding closed roads or trails in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area. In addition, the use of native seed and transplanted sagebrush could provide additional forage and habitat for sagebrush obligate wildlife such as pronghorn, northern sagebrush lizard, and sagebrush vole.

Impacts to wildlife habitat from not reducing sagebrush canopy cover to less than 15% during fuels treatment in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area. Impacts to wildlife habitat from the use of fuel breaks in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area.

Impacts to wildlife habitat from vegetation treatments in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area.

Impacts to wildlife habitat from not allowing fuels treatments in known Greater Sage-Grouse winter range would be the same as Alternative B.

Avoiding (not conducting) sagebrush reduction/treatments to increase livestock or big game forage in Greater Sage-Grouse priority and general habitat, and including plans to restore high-quality habitat in areas where invasive species are present could affect wildlife species differently. Some big game may not benefit from increases in sagebrush forage as much as sagebrush obligate wildlife such as pronghorn, northern sagebrush lizard, and sagebrush vole, which could be affected by high quality sagebrush habitat for forage and cover.

Impacts to wildlife habitat from reclamation of Greater Sage-Grouse habitat in accordance to the Wyoming Reclamation Policy (BLM 2009a) would be the same as Alternative A.

Rehabilitating exotic seedings to recover sagebrush in areas to expand Greater Sage-Grouse priority and general habitat could benefit sagebrush obligate wildlife such as pronghorn, northern sagebrush lizard, and sagebrush vole, but could impact other wildlife that are using the existing seedings from habitat loss. Short-term impacts to wildlife and wildlife habitat could occur from restoration activities by human and vehicle presence, noise, or surface disturbance and runoff, but the long-term impacts could benefit the wildlife that would use the restored habitat.

Impacts to wildlife habitat from prioritizing restoration projects and the use and allocation of native seed within priority Greater Sage-Grouse habitat would be the same as Alternative B, but would also encompass Greater Sage-Grouse general habitat, affecting wildlife in a larger area.

Impacts to wildlife habitat from altering existing seedings where appropriate to benefit Greater Sage-Grouse in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area.

Including pretreatment data on existing habitat conditions in plans for vegetation treatments would provide valuable data when conducting monitoring post-treatment and could lead to improved habitat conditions for wildlife. Excluding or closing areas to livestock grazing for at least three years following vegetation treatments could allow treated areas to revegetate, soils to stabilize, and for vegetation to mature to the point of withstanding grazing pressure. Rested areas could provide wildlife with new vegetation for forage without competition with livestock during the rest period. Long-term monitoring of vegetation treatments can provide data on post-revegetation conditions. Data collected could be used in future revegetation projects, and could provide feedback on the success or needs for improving of the methods being used in revegetation efforts, which could affect wildlife conditions from habitat improvements.

Impacts to wildlife habitat from the management of wild horses with the consideration of Greater Sage-Grouse populations would be the same as Alternative B.

Impacts to wildlife habitat from conducting land health assessments for HMAs, and the management of wild horses in priority Greater Sage-Grouse habitat would be the same as Alternative B.

Impacts to wildlife habitat from designing and implementing fuels treatments, the use of prescribed fire, and post-fuels management in Greater Sage-Grouse priority and general habitat would be the same as Alternative B, except it would apply to a larger area.

Managing lands within Greater Sage-Grouse priority and general habitat to be in the good or better ecological condition to help minimize adverse impacts of fire could prevent the impacts of wildland fire on wildlife habitat. Managing lands to be in the good or better condition could also affect wildlife by providing healthy forage and cover and habitat void of invasive, non-native plant species. Preventing wildland fire could provide habitat protection for wildlife from habitat loss, soil damage, erosion, excessive runoff, and the spread of invasive, non-native plant species from catastrophic fire events.

Fuels treatments that focus on interfaces with human habitation or significant existing disturbances within Greater Sage-Grouse priority and general habitat, could reduce impacts of fuels treatments in other habitat where wildlife are more likely to be found. Since interfaces with human habitation are not ideal habitat for most native wildlife species, effects to wildlife from vegetation removal, surface disturbance, and the presence of humans, vehicles and equipment could be lower than in areas a mile or more away from human habitation. Alternative C would prioritize fire operations in priority and general habitat, immediately after life and property; therefore, the potential for disturbance to terrestrial wildlife within priority habitat is the same as Alternative B and is protected more than Alternative B in general habitat. With regard to fuels management, Alternative C is more restrictive than Alternative B since all of the management actions fall within priority and general habitats; therefore, impacts from fuels management on terrestrial wildlife are expected to be less than Alternative B.

Establishing adequately sized exclosures (free of livestock grazing) for post-fire recovery that can be used to assess recovery within Greater Sage-Grouse priority and general habitat could protect recovering habitat from livestock grazing while vegetation is re-establishing. Allowing vegetation to become re-established without livestock could provide habitat and forage for wildlife without the threats of competition from livestock.

Resting or closing treated areas from livestock grazing for two years or longer after prescribed burns would allow treated areas to revegetate, soils to stabilize, and vegetation to mature to the point of withstanding livestock grazing pressure. Rested areas could provide wildlife with new vegetation for forage without competition with livestock during the rest period.

Maintaining fuels treatments, such as mowed areas, within Greater Sage-Grouse priority and general habitat may reduce the need for destructive fire suppression techniques, such as bulldozed fire lines. Mowed areas could still be used by small wildlife for cover and by grazing animals for forage.

Impacts to wildlife habitat from using fire suppression to protect Greater Sage-Grouse connectivity habitat would be the same as Alternative B.

Impacts to wildlife habitat from managing the level of density of disturbance within Greater Sage-Grouse connectivity habitat would be the same as Alternative B.

Impacts to wildlife from a 3% limit of disturbance per section (640 acres) when permitting APDs on existing leases within Greater Sage-Grouse priority habitat would be the same as Alternative B.

Impacts to wildlife habitat from not allowing new surface occupancy on federal leases within Greater Sage-Grouse priority habitat and connectivity habitat areas would be the same as Alternative B.

Impacts to wildlife habitat from restrictions on exploratory drilling that prohibits surface disturbing activity and related activities that are disruptive to Greater Sage-Grouse, including vehicle traffic and other human presence during nesting and early brood-rearing season in Greater Sage-Grouse priority, general and connectivity habitat, could be reduced as compared to Alternative A. Alternative C could allow more contiguous, uninterrupted habitat which could buffer wildlife from human and other disturbance and is necessary for wildlife to breed, migrate, forage, seek cover, and complete their life histories.

Impacts to wildlife habitat from conservation measures within Greater Sage-Grouse winter concentration areas would be the same as Alternative B.

Impacts to wildlife habitat from limiting noise would be the same as Alternative B.

Impacts to wildlife habitat from the use of adaptive management strategies would be the same as Alternative B.

4.21.6 Alternative D

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

The impacts on wildlife species resulting from restricting utility structures within Greater Sage-Grouse core and connectivity habitat areas would be similar to those identified in Alternative A, except new transmission projects would be allowed only within a designated two-mile wide transmission corridor and within 0.5 miles either side of existing 115kV or larger transmission lines. Impacts to wildlife habitat from new construction within existing ROWs could have impacts to vegetation within the ROW corridors where the land within a two-mile wide pathway has been previously disturbed from prior facility construction. Some species associated with grassland areas, such as pronghorn and western meadowlark could be disturbed or forced to abandon areas of early seral growth which is desirable forage for big game if areas under existing ROWs were developed. Construction activities could disturb other nearby wildlife causing species to vacate the area and move to lower quality habitat. Moving from desirable habitat can result in stress, mortality or lower reproductive rates and offspring survival. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. New utility towers could provide perch sites for raptors and other bird species, but power lines may also cause mortality to bats or birds from collisions or electrocution.

If construction of new ROW corridors were to occur, the resulting fragmentation of formerly intact habitat could affect wildlife populations by severing migration routes to seasonal habitat areas and parturition habitat. New projects would have seasonal stipulations that would help prevent disturbance to wildlife species during those timeframes. Management for construction would consider impacts to Greater Sage-Grouse populations and be designed to minimize impacts through project design and mitigation. The considerations could reduce the impacts from disturbance and habitat loss by habitat avoidance or timing of construction. Surface disturbance from construction of new ROWs would remove vegetation resulting in fragmentation of formerly intact habitat. Fragmenting habitat could affect wildlife populations by severing migration routes or forcing wildlife away from areas of early seral growth, which are areas desired by wildlife. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided.

Impacts to wildlife from managing 5,230,110 acres of ROW exclusion areas within Greater Sage-Grouse core and connectivity habitat would be the same as Alternative B; however, the density of disturbance limit for this alternative is 9%, allowing greater disturbance of habitat from development activities before mitigation would be made necessary.

Allowing Greater Sage-Grouse general habitat to be available for new ROWs or SUAs subject to BMPs, with 1,300,510 acres of avoidance areas (1,159,830 acres fewer than Alternative A), could impact wildlife from direct habitat loss and fragmentation of habitat. Allowing Greater Sage-Grouse general habitat to be available for new ROWs or SUAs subject to BMPs could affect wildlife in a variety of ways. Surface disturbance from construction of new ROWs would remove vegetation resulting in fragmentation of formerly intact habitat. Fragmenting habitat could affect wildlife populations by severing migration routes. Disturbed areas would be more vulnerable to invasion of noxious weeds and would not initially provide the same level of habitat function, forage, or cover that the original area provided. Construction activities could disturb other nearby wildlife causing species to vacate the area and move to lower quality habitat. Moving from desirable habitat can result in stress, mortality or lower reproductive rates and offspring survival.

Maintenance and upgrades of existing structures could result in short-term disturbance of wildlife from human and vehicle activity, but long-term impacts would be minimal.

Impacts to wildlife from the development of wind energy would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,608,420 acres (Map 2-32), which would reduce the level of wind energy development and related impacts on wildlife. As a result of these restrictions, 980 turbines are expected to be developed, 274 fewer than under Alternative A. Restrictions on MET towers would have the same impacts on wildlife as in Alternative A.

Impacts to wildlife from retaining ownership of Greater Sage-Grouse core and connectivity habitat would be the same as Alternative B.

Impacts to wildlife from acquisitions or conservation easements would be the same as Alternative A.

Acquiring lands based on a variety of economic resource criteria could have limited effects to wildlife depending on the lands acquired or exchanged.

Impacts to wildlife from livestock grazing management would be the same as Alternative A.

Working cooperatively with permittees, leasees, and other landowners to develop grazing management strategies on an allotment-by-allotment basis to improve Greater Sage-Grouse habitat could affect sagebrush dependent wildlife species from possible habitat improvement. It is unknown, however, what level of long-term protection of habitat would occur, because the outcome is at each permittee's, leasee's or landowner's discretion. If permittees, leasees, or landowners agree to develop grazing management strategies, there could be a reduction of habitat loss in sagebrush or Greater Sage-Grouse habitat, or there could be seasonal closures.

Impacts to wildlife from adjusting livestock grazing leases, monitoring, and renewing livestock grazing permits would be the same as Alternative A.

Impacts to wildlife from developing conservation plans to meet seasonal Greater Sage-Grouse habitat requirements in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative A.

Impacts to wildlife from authorizing retirement of grazing allotments in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative A, although under Alternative D, a limit of 15% of a planning unit would constrain how much land could be retired or rested.

Impacts to wildlife from considering drought conditions in livestock grazing management would be the same as Alternative A.

Impacts to wildlife from evaluating range improvements would be the same as Alternative B, but would also apply to Greater Sage-Grouse general habitat as well as core and connectivity habitat.

Impacts to wildlife from livestock trailing management and water developments would be the same as Alternative A. In addition, avoiding Greater Sage-Grouse habitat could benefit wildlife that use these areas by reducing the degree of disturbance, habitat loss, soil compaction, erosion, sedimentation, and the spread of invasive, non-native plant species. Impacts to wildlife from riparian area management would be the same as Alternative B.

Impacts to wildlife from exceptions to lease stipulations, COAs, and terms and conditions would be the same as Alternative A.

Under Alternative D, 964,860 acres would be closed to oil and gas leasing, 93,080 more as compared to Alternative A, and 15,769 wells are predicted to be developed, 642 fewer than under Alternative A. Impacts to wildlife from oil and gas leasing would be the same as those described under Alternative A. Impacts to wildlife from geophysical operations and offsite mitigation would be the same as Alternative A.

Impacts to wildlife from working with proponents holding valid existing leases would be the same as Alternative B.

Impacts to wildlife from working with project proponents to site their projects in locations that minimize impacts to sensitive resources would be the same as Alternative A.

Impacts to wildlife from using unitization would be the same as Alternative B.

Impacts to wildlife habitat from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative A.

Impacts to wildlife from coal lease development and exploration would be the same as Alternative A.

Impacts to wildlife from non-energy leasable minerals would be the same as Alternative A (261,000 acres of closed areas). In addition, mitigation measures in project planning could ensure that viable and functional habitat would be restored to the project area. These objectives could reduce initial disturbance, speed up rehabilitation of sites, and/or create other areas as usable wildlife habitat. Allowing projects meeting compliance of surface occupancy and disturbance and density stipulations could reduce fragmentation of habitat, and may reduce other impacts from using existing infrastructure.

Impacts to wildlife from locatable and salable mineral activities would be the same as Alternative A and could occur within 1,892,620 acres for locatable minerals and 472,800 acres for salable minerals, the same as Alternative A. Impacts to wildlife from salable mineral pits would be the same as Alternative A.

Impacts to wildlife from approving BLM SRPs and Forest Service RSUAs would be the same as Alternative A.

Impacts to wildlife from managing open OHV areas would be the same as Alternative A.

Impacts to wildlife from limiting motorized travel to existing roads, primitive roads, and trails would be the same as Alternative A.

New road construction would avoid areas within 0.25 miles of the perimeter of occupied Greater Sage-Grouse leks within Greater Sage-Grouse core and connectivity habitat. The management would provide buffer distances for wildlife that use lek or sagebrush habitat from the presence and construction activities of roads, but not to the extent described under Alternative C. This alternative provides the smallest buffer distance and the least protection of the action alternatives to wildlife from the impacts from the building and presence of roads within Greater Sage-Grouse lek habitat. Road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Human presence and vehicles may force wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions of wildlife with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals to hunt, such as raptors and foxes, but these areas may be avoided by prey species which may move to less desirable habitat to avoid predation.

Impacts to wildlife from upgrading roads would be the same as Alternative A.

Allowing natural deterioration of roads not designated in travel management plans within Greater Sage-Grouse core, connectivity, and general habitat could prevent effects from short-term impacts during reclamation efforts, such as displacement from human and vehicle activities, which could move animals into less desirable habitat and could increase competition for available resources with other species and uses. Vehicle routes are vulnerable to invasion of noxious weeds which could spread during the natural deterioration of the road.

Applying natural reseeding within Greater Sage-Grouse core, connectivity, and general habitat would allow for succession of native plant species to revegetate undesignated roads or routes. This could affect wildlife from the regrowth of plant species appropriate to the existing habitat, which would be consistent with the surrounding habitat already being used by wildlife species.

Managing for vegetation composition and structure that reflects desired plant community or comparable standard Greater Sage-Grouse core and connectivity habitat could affect wildlife from vegetation management, depending on the location and habitat type.

Impacts to wildlife from vegetation treatments for sagebrush habitat in Greater Sage-Grouse core and connectivity habitat would be the same as described in Alternative A. In addition, the protocol in Appendix A would support more specific reclamation of Greater Sage-Grouse and sagebrush habitats, providing restoration of functional habitat for sagebrush obligate wildlife. If the protocol is followed, soil erosion and introduction of exotic or invasive plant species could be minimized and the landscape could be reclaimed to the original habitat components and structure to the extent possible. While the initial disturbance would result in habitat loss, sagebrush habitat could be restored over the long term, although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas. Working collaboratively with partners to maintain and enhance Greater Sage-Grouse habitats could provide additional resources to apply to sagebrush management and could affect sagebrush obligate wildlife with enhanced habitat and forage.

Treated areas that were not rested from livestock grazing could affect wildlife from habitat loss, soil compaction, or spread of invasive, non-native plant species. Resting treated areas from grazing can allow treated areas to establish new vegetation, allow soils to stabilize, and prevent invasive, non-native plant species to be tracked into the treated area by livestock.

Impacts to wildlife from reclamation of Greater Sage-Grouse habitat would be the same as Alternative A.

Impacts to wildlife from weed-free seed and mulch, desirable non-native species or sterile perennials, or reclaiming to native site plant composition for reclamation projects would be the same as Alternative A. Use of native and non-native plant seeds for vegetation seedings in Greater Sage-Grouse core and connectivity habitat could reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Areas that restore with native plant composition provide habitat and cover for wildlife species and can support healthy wildlife populations.

Greater Sage-Grouse habitat restoration projects in annual grassland restoration would be prioritized commensurate with its threat to the region within Greater Sage-Grouse core and connectivity habitat would affect wildlife from vegetation removal and human disturbance. Short-term impacts to wildlife and wildlife habitat could occur from restoration activities by human and vehicle presence, noise, or surface disturbance and runoff, but the long-term impacts would benefit the wildlife that would use the restored habitat. Wildlife using grassland habitat, such as big game, western meadowlark, and rough-legged hawk could be displaced as the habitat is converted, possibly to lower quality habitat or areas with more competition for resources. Restoration of sagebrush habitat could benefit sagebrush obligate wildlife such as pronghorn, northern sagebrush lizard, and sagebrush vole, but could impact other wildlife that are using the existing grassland from habitat loss.

Impacts to wildlife from grasshopper and cricket control would be the same as Alternative A.

Impacts to wildlife from wild horse population management would be the same as Alternative A.

Impacts to wildlife from prioritizing AMLs and prioritizing and conducting land health assessments in BLM HMAs in Greater Sage-Grouse core and connectivity habitat would be the same as Alternative B.

Impacts to wildlife from rehabilitation for areas burned by wildland fires, using wildland fire, prescribed fire, fire suppression techniques, and AMR would be the same as Alternative A.

Impacts to wildlife from the use of monitoring plans would be the same as Alternative B.

Under Alternative D, management would not allow more than three locations of energy production to occur within 640 acres. In addition, the combined value of the disturbance (existing and proposed) may not exceed 9% loss of sagebrush habitat. Allowing a density of three energy production facilities/structures per 640 acres could displace wildlife, and the possible long-term habitat deterioration could eliminate potential habitat that may provide refuge for wildlife species displaced from current territories. Conversion of large areas to early seral stage vegetation or cheatgrass could occur as well pads are reclaimed. Conversion of large expanses to early seral vegetation could result in additional habitat loss from large plant cover, but could increase desired browse vegetation for ungulates and other grazing animals. The spread of cheatgrass or other invasive, non-native plant species could diminish habitat quality and availability of native plant species for forage and cover. In addition, not including other disturbances such as coal and trona mines, and buried pipelines and power lines in the density calculations would, in some cases where these sites occur, increase actual disturbance density above three per 640 acres and further increase impacts to wildlife and habitat. For connectivity areas, impacts from management under Alternative D would be the same as

described above, except there is no limitation to the number of disruptive activities per 640 acres, but the combined 9% limit of disturbance per 640 acres would be in effect.

Impacts to wildlife from offsite mitigation would be the same as Alternative A, but would apply to Greater Sage-Grouse core and connectivity habitat. The 9% disturbance threshold would limit the level of disturbance within Greater Sage-Grouse core and connectivity habitat; however, the impacts to wildlife from disturbance would not change.

Impacts from implementing restrictions on surface disturbing activity or surface occupancy within 0.25 miles of lek habitat (Greater Sage-Grouse core, general, and connectivity habitat), would be similar to those described under Alternative A (excluding Bates Hole and Fish Creek/Willow Creek). There would be a total of 75,870 acres within Greater Sage-Grouse core, general and connectivity habitat that would have surface disturbance restricted.

Applying seasonal restrictions on surface disturbing and/or disruptive activity during nesting and early brood-rearing season in Greater Sage-Grouse core, general, and connectivity habitat from March 15 to June 30 could protect habitat within two miles of a lek and the wildlife species that use or occur within the identified area. This management could allow for fewer disturbances to wildlife from noise, human presence, vehicle use, vegetation loss, and the introduction and spread of invasive, non-native plant species, which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat.

Prohibiting surface disturbing and/or disruptive activities in mapped Greater Sage-Grouse winter concentration areas within Greater Sage-Grouse core habitat and connectivity areas from November 15 to March 14 would affect wildlife as described under Alternative A.

Impacts to wildlife from minimizing impacts from predators are the same as Alternative A. In addition, implementing the strategies and techniques outlined in Appendix F for predators would provide protection to wildlife by removing habitat and attractive areas where predators feed and hunt.

Impacts to wildlife from noise minimization would be the same as Alternative A.

Impacts to wildlife habitat from the use of adaptive management strategies would be the same as Alternative B.

4.21.7 Proposed Land Use Plan Amendments

See Alternative B for impacts common to Alternatives B, C, and D and the Proposed LUP Amendments.

The impacts to wildlife from ROW construction would be similar to those described under Alternative A, except ROW avoidance areas would increase by 3,748,650 acres. This could reduce ROW construction activities and related impacts to wildlife habitat. Impacts to wildlife would be the same as Alternative D from seasonal restrictions on project development. Requiring raptor perching deterrents could reduce the effects to prey species from hunting by predatory bird species; however, predatory birds would not benefit from hunting perches. Including transmission lines outside of transmission corridors in the 5% disturbance calculation could reduce wildlife habitat loss and reduce disruptions in habitat connectivity. Disturbance and development can create travel or migration barriers which can alter distribution patterns, increasing stress and energy loss and fitness in wildlife species.

Impacts to wildlife from removing, modifying, or burying existing power lines, and reclaiming linear features such as roads or fences would be the same as Alternative B.

Impacts to wildlife from the development of wind energy would be similar to those identified under Alternative A, except wind avoidance areas would be increased to 4,731,350 acres (Map 2-33), which would reduce the level of wind energy development and related impacts on wildlife. As a result of these and other land use restrictions, 127 turbines are expected to be developed, 90% fewer turbines than under Alternative A.

Impacts to wildlife from retaining public ownership of PHMAs would be the same as Alternative B.

Impacts to wildlife from identifying areas where acquisitions or conservation easements for PHMAs could occur would be the same as Alternative B.

Utilizing Greater Sage-Grouse habitat requirements to prioritize parcels for exchange or acquisition within PHMAs could affect wildlife by providing habitat management for sagebrush obligate species such as sagebrush vole, pronghorn, or northern sagebrush lizard.

Evaluation of withdrawals for consistency with Greater Sage-Grouse conservation could identify areas where additional habitat could be available for wildlife habitat in the future.

Impacts to wildlife from livestock grazing, rangeland, and vegetation management on BLM-administered lands would be the same as Alternative A. On National Forest System lands, grazing guidelines would be implemented that limit the amount of allowable use on perennial grass, shrubs, upland herbaceous species, and herbaceous riparian/wet meadow vegetation. These guidelines would reduce grazing impacts on vegetation resources compared with Alternative A.

Impacts to wildlife from working cooperatively with permittees, leasees, and other landowners to develop grazing management strategies would be the same as Alternative B.

Impacts to wildlife from AMPs would be the same as Alternative A. In addition, within PHMAs, incorporating site-specific Greater Sage-Grouse habitat objectives and management considerations could increase the protection of sagebrush obligate species, such as sagebrush vole, pronghorn, or northern sagebrush lizard protection.

Impacts to wildlife from evaluating land health standards in PHMAs could provide improvements to sagebrush or other habitat desirable to Greater Sage-Grouse. Habitat improvements could affect sagebrush obligate species such as sagebrush vole, pronghorn, or northern sagebrush lizard with protection or improvement from sagebrush focused management.

Impacts to wildlife from authorizing retirement of grazing allotments in PHMAs would be the same as Alternative A.

Impacts to wildl9ife from considering drought conditions in livestock grazing management would be similar to Alternative D, except management actions would not be limited to season of use or stocking rate changes and drought contingency plans would be developed. This could allow greater ability to reduce impacts from livestock grazing.

Impacts to wildlife from range improvements would be the same as Alternative A.

Impacts to wildlife from livestock trailing management would be the same as Alternative C.

Impacts to wildlife from managing livestock grazing in riparian/wetland habitat and water development would be the same as Alternative B.

Impacts to wildlife from exceptions to lease stipulations, COAs, and T&Cs would be the same as Alternative A.

Under the Proposed LUP Amendments, 883,670 acres would be closed to oil, gas and CBNG leasing, 11,890 more acres when compared to Alternative A. Impacts to wildlife habitat from oil and gas leasing would be the similar to those described under Alternative A, except areas managed with NSO and CSU stipulations would be greatly increased to 441,690 and 6,438,480 acres, respectively. As a result, a total of 14,817 wells would be developed under the Proposed LUP Amendments, 1,594 fewer wells than under Alternative A. This would further reduce wildlife habitat loss and degradation caused by fluid mineral development.

Applying a minimum lease size could provide a more contiguous, uninterrupted habitat for wildlife which could allow for unfragmented migration or travel pathways between habitat areas, and could protect wildlife from human presence and other disturbance or disruptive activities.

Impacts to wildlife habitat from geophysical exploration would be the same as Alternative B.

Impacts to wildlife from offsite mitigation would be the same as Alternative A. Impacts to wildlife from working with proponents holding valid existing leases would be the same as Alternative B.

Impacts to wildlife from working with project proponents to site their projects in locations that minimize impacts to sensitive resources would be the same as Alternative A.

Impacts to wildlife from considering or encouraging Master Development Plans and unitization within PHMAs would be the same as Alternative B.

Impacts to wildlife from requiring reclamation bonds would be the same as Alternative B.

Impacts to wildlife from produced water would be the same as Alternative A.

Impacts to wildlife habitat from applying conservation measures to split-estate land ownership (federal surface/private surface or federal surface/private minerals) would be the same as Alternative B.

Impacts to wildlife from coal surface and underground mining and coal exploration would be the same as Alternative A.

Impacts to wildlife from leasing non-energy leasable minerals would be the same as Alternative D.

Impacts to wildlife from locatable mineral development activities would be similar to Alternative A, except 1,146,130 acres within PHMAs would be proposed for withdrawal or considered for proposed withdrawal, which would eliminate all impacts from locatable mineral development within these areas.

Impacts to wildlife from salable mineral activities would be the same as Alternative A.

Impacts to wildlife from salable mineral pits would be the same as Alternative B.

Approving BLM SRPs and Forest Service RSUAs in PHMAs, unless negative impacts to Greater Sage-Grouse cannot be adequately mitigated, would be the same as Alternative A; however, those impacts would be mitigated, resulting in short- and long-term impacts to wildlife where impacts occur and where mitigation is applied. Displacement of wildlife as a result of both short- and long-term impacts from human

and vehicle activities could lead to animals moving into less desirable habitat and could increase competition for available resources with other species and habitat uses.

Impacts to wildlife from no new ACECs/SIAs for Greater Sage-Grouse conservation would be the same as Alternative D.

Impacts from OHV "open" areas would be the same as Alternative B, except for the Poison Spider OHV Park which would be the same as Alternative A.

Impacts to wildlife from limiting motorized travel would be the same as Alternative A.

Impacts from avoiding areas within 1.9 miles of the perimeter of occupied Greater Sage-Grouse leks for new and primary roads, and prohibiting construction within 0.6 miles of sage-grouse leks for other new roads would be similar to Alternative B. Road construction can create barriers in migration corridors, fragmentation of habitat, and overall habitat loss. Vegetation loss, erosion, and the spread of invasive, non-native plant species may also occur during or following road construction. Human presence and vehicles may force wildlife species away from desired habitat to lower quality, less desirable habitat. Collisions with vehicles may also occur when roads are constructed within wildlife habitat. Road corridors are desirable areas for predatory animals, such as raptors and coyote, but these areas may be avoided by prey species that may move to less desirable habitat to avoid predation.

Impacts to wildlife habitat from road upgrades and limiting route construction to realignments of existing routes in PHMAs would be the same as Alternative B.

Impacts to wildlife habitat from restoring roads or trails not designated in travel management plans within PHMAs would be the same as Alternative B.

Impacts to wildlife habitat from reseeding closed roads or trails in PHMAs would be the same as Alternative B.

Impacts to wildlife habitat from using ESD potential vegetation composition and structure within PHMAs and GHMAs would be the same as Alternative B, but would apply to a larger area (PHMAs and GHMAs) than Alternative B.

Impacts to wildlife habitat from vegetation treatments that would not reduce sagebrush canopy cover to less than 15% in nesting and winter habitat in PHMAs would be the same as Alternative B. Limiting this to northeast Wyoming could ensure that this management would be appropriate to the conditions inherent to the local environment and could allow for effective results from vegetation treatments, providing varied structure of sagebrush habitat for use by sagebrush obligate wildlife such as sagebrush vole, pronghorn, or northern sagebrush lizard.

Impacts to wildlife from vegetation treatments for sagebrush habitat in PHMAs would be the same as described in Alternative D.

The protocol in Appendix A would support more specific reclamation of Greater Sage-Grouse and sagebrush habitats, providing restoration of functional habitat for sagebrush obligate wildlife. If the protocol is followed, soil erosion and introduction of exotic or invasive plant species could be minimized and the landscape could be reclaimed to the original habitat components and structure to the extent possible. While the initial disturbance would result in habitat loss, sagebrush habitat could be restored over the long-term, although some areas of habitat, such as winter habitat, could be difficult to restore to original conditions due to the composition and size of sagebrush in these areas. Surface disturbance may also provide

opportunities for invasive plant species (e.g. cheatgrass) to establish, making it difficult to restore sagebrush habitat with native species in some areas. Working collaboratively with partners to maintain and enhance Greater Sage-Grouse habitats could provide additional resources to apply to sagebrush management and could affect sagebrush obligate wildlife with enhanced habitat and forage. Monitoring the treatments could provide feedback to whether the treatments were successful and if changes should be made in the approach to methods or timing in the area.

Impacts to wildlife from resting treated areas from grazing would be the same as Alternative A.

Impacts to wildlife from restoration of sagebrush habitat would be the same as Alternative B.

Use of native and non-native plants and seeds could reduce the risk of disturbed areas being inundated by invasive, non-native plant species. Preventing the spread of invasive plant species could help the reclamation area restore to original site vegetation composition. Areas that restore with native plant composition provide habitat and cover for wildlife species and can support healthy wildlife populations.

Impacts to wildlife from managing post ES&R and BAER areas and altering existing seedings would be the same as Alternative B. The Proposed LUP Amendments would give priority to fire operations in PHMAs, immediately after firefighter and public safety. However, this would happen only after other resource values managed by the BLM and Forest Service are considered and if an exemption is warranted. With regard to fuels management, Alternative C is more restrictive than the Proposed LUP Amendments since all of the management actions fall within PHMAs and GHMAs; therefore, impacts from fuels management on terrestrial wildlife are less than Alternative B. Concurrently, the Proposed LUP Amendments offer the same protective measures as Alternative B; however, there is greater potential for more benefits to terrestrial wildlife than Alternatives B and C with the placement of green strips and/or fuel breaks and the development of wildfire prevention plans would be developed to revegetate green strips with native fire resistant/resilient species.

Impacts to wildlife from giving priority for implementing specific sage-grouse habitat restoration and establishing seed harvest areas would be the same as Alternative B.

Impacts to wildlife from vegetation treatment planning would be the same as Alternative C.

Impacts to wildlife from grasshopper and cricket control would be the same as Alternative A; however, working collaboratively with partner agencies to maintain and enhance Greater Sage-Grouse habitat in PHMAs could reduce the effects to wildlife from treatment for insects.

Impacts to wildlife from wild horse management would be the same as Alternative B.

Impacts to wildlife from designing and implementing fuels treatments within PHMAs would be the same as Alternative B. In addition, the protocol in Appendix A could provide treatment protocol for Greater Sage-Grouse and sagebrush habitats, which could lead to functional habitat for sagebrush obligate wildlife from treatment activities. If the protocol is followed, habitat loss, soil erosion, and introduction of exotic or invasive plant species could be minimized and the landscape could reclaim to the original habitat components and structure to the extent possible.

Impacts to wildlife from restoring and recovering burned areas and fuels treatments within PHMAs would be the same as Alternative B. In addition, the protocol in Appendix A could provide treatment protocol for Greater Sage-Grouse and sagebrush habitats, which could lead to functional habitat for sagebrush obligate wildlife from treatment activities. If the protocol is followed, habitat loss, soil erosion, and introduction of

exotic or invasive plant species could be minimized and the landscape could reclaim to the original habitat components and structure to the extent possible.

Impacts to wildlife from managing post-fuels management areas within PHMAs would be the same as Alternative B.

Impacts to wildlife using wildland fire, prescribed fire, and fire suppression techniques would be the same as Alternative A.

Impacts to wildlife from fire suppression within PHMAs would be the same as Alternative B.

Impacts to wildlife from the use of monitoring plans within PHMAs would be the same as Alternative B.

Under the Proposed LUP Amendments, the BLM and Forest Service could limit the density of oil and gas or mining activities to no more than an average of one disruptive activity to occur within 640 acres within PHMAs (core only); the combined value of surface disturbance (existing and proposed) may not exceed 5% loss. For PHMAs (connectivity only), all surface disturbance (any program area) would be limited to no more than 5% of PHMAs (core only) per 640 acres, using the DDCT process described in Appendix D.

Impacts to wildlife from using mitigation would be the same as described in Alternative A.

Under the Proposed LUP Amendments, surface disturbing activity or surface occupancy would be prohibited within 0.6 miles of occupied Greater Sage-Grouse leks inside PHMAs and within 0.25 miles of occupied Greater Sage-Grouse leks outside of PHMAs, which could protect up to 337,860 acres of habitat. When compared with Alternative A, these restrictions could protect up to 269,310 more acres of sage-grouse habitat.

Pronghorn and mule deer have the greatest overlap of lek acreages for all big game, and would likely be impacted the most from development activities within lek buffers and other sagebrush habitat. The greater the impacts to sagebrush habitat from oil, gas, and other surface disturbing activity, the greater the impacts to pronghorn, mule deer and other game species from habitat loss and disturbance from human activity, noise and invasive, non-native plant species. All big game species found within the planning area use Greater Sage-Grouse lek habitat for some portion of their life histories, some more than others.

Applying seasonal restrictions on surface disturbing and/or disruptive activity during breeding, nesting and early brood-rearing season in PHMAs (core only), within four miles of leks in PHMAs (connectivity only) and within two miles of leks in GHMAs from March 15 to June 30 could protect habitat and the wildlife species which use or occur within the identified area. This management could allow for fewer disturbances to wildlife from noise, human presence, vehicle use, vegetation loss, and introduction and spread of invasive, non-native plant species which can force wildlife to move from high quality habitat to areas of lower quality, less desirable habitat. Impacts would be the same as described under Alternative A, but would provide more area of protection within PHMAs (core only) (except for Bates Hole and Fish Creek/Willow Creek).

Prohibiting surface disturbing and/or disruptive activities in Greater Sage-Grouse winter concentration areas from December 1 to March 14 would affect wildlife as described under Alternative A.

Impacts to wildlife from minimizing impacts from predators are the same as Alternative D.

Restricting noise at the perimeter of sage-grouse leks to not exceed 10 dBA above background noise could reduce disturbance to wildlife species and could prevent wildlife from abandoning habitat and moving to

less desirable areas. Mule deer exhibit a stress response to disturbances associated with noise and activity up to 0.29 miles from the source (Freddy et al. 1986). Noise minimization can reduce stress responses, prevent a reduction in reproductive success, and prevent decreased immune response (Pater et al. 2009).

Impacts to wildlife habitat from the use of adaptive management strategies would be the same as Alternative B.

4.22 CUMULATIVE IMPACTS

This section defines cumulative impacts, describes the methodology used for assessing these impacts, describes projects and activities considered in this assessment, and presents the results organized by resource topic.

Cumulative impacts are the effects on the environment that result from implementing any of the alternatives in combination with other actions outside the scope of these plan amendments, either within the planning area or outside it. The CEQ regulations for implementing NEPA define cumulative impacts as—

> *"The impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR §1508.7).*

The full effect of any single action cannot be determined by considering that action in isolation, but must be determined by considering the likely result of that action in conjunction with many others. The cumulative impact analysis for the Wyoming Greater Sage-Grouse LUP Amendments evaluates the potential impacts associated with the management alternatives in combination with the potential impacts associated with other relevant activities that have occurred, are occurring, or are likely to occur in the vicinity of the planning area.

4.22.1 Impact Assessment Methodology

Land use planning is BLM's and Forest Service's broadest level of decision-making. BLM and Forest Service planning-level decisions are programmatic decisions that allocate resources or specify allowable uses in all or portions of the planning area to emphasize certain management direction. Site-specific actions are rarely addressed in an RMP or LRMP. As a result, the cumulative impact analysis is also broad and general in nature. The analysis presents ranges and qualitative conclusions as opposed to bounded quantified details. These cumulative impacts will then be considered in subsequent NEPA documents that analyze specific projects or programs.

Analysis and description of the identifiable effects of past actions are required to the extent they are relevant and useful in analyzing whether the reasonably foreseeable effects of the alternatives may have a continuing, additive, and significant relationship to those present effects. Based on scoping, agencies have discretion on what is useful concerning past action for the agency's analysis of the effects of present action and its reasonable alternatives. Effects of past actions and activities on resources are manifested in the current condition of the resource, which is described in Chapter 3 (Affected Environment) for resources on lands administered by BLM or Forest Service within the planning area. Specific information presented in Chapter 3 is not repeated here.

CEQ guidance directs cumulative impact analysis to focus on important issues of national, regional, or local significance. This analysis focuses on LUP actions that, when combined with other past, present, and reasonably foreseeable future actions, would collectively be significant. Not all issues identified for direct or indirect impact assessment in these LUP Amendments are analyzed for cumulative effects. Because of the wide geographic scope of a cumulative impact assessment and the variety of activities assessed, cumulative impacts are commonly examined at a more qualitative and less detailed level than are direct and indirect impacts.

Public documents prepared by federal, state, and local government agencies are the primary sources of information regarding past, present, and future actions considered in the cumulative effects analysis. Actions undertaken by private persons and entities are assumed to be captured in the information made available by such agencies. Speculative or uncommitted projects are not included in the projections. These projections are not planning decisions. Using them in this analysis does not constitute approval by BLM, Forest Service or any authorizing agency. These projections do not set a limit or cap on future BLM or Forest Service actions. Unforeseen changes in such factors as economics; public demand; and federal, state, and local laws and policies could result in different outcomes than those projected for this analysis.

Potential cumulative impacts are described for each affected resource within a defined cumulative impact analysis area (CIAA). The CIAA covers different geographic areas depending on the specific resource being evaluated. The CIAAs are described in each of the resource sections below. CIAAs that extend beyond the planning area are largely for resources that are mobile or migrate, compared to resources that are stationary. For example, the air quality CIAA is large because it is based on the complex interaction between climatic factors, terrain, and the potential for significant impacts to occur in sensitive areas within the airshed. Smaller CIAAs were established for resources that are stationary such as cultural resources, minerals, and visual resources. In some cases, these CIAAs might be the same as the planning area boundary. Activities and development that occur within or outside the CIAAs have the potential to create cumulative impacts on the specific resource being analyzed.

BLM and Forest Service considered the following factors in this cumulative impact assessment:

- Federal, non-federal, and private actions
- The potential for effects to cross political and administrative boundaries
- Other spatial and temporal characteristics of each affected resource
- The comparative scale of cumulative impacts across alternatives
- Scoping comments.

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions that might contribute to an impact. The baseline date for the cumulative impacts analysis is 2012. The temporal scope of this analysis is a 20-year planning horizon. Land use planning documents are generally evaluated on a five-year cycle.

Spatial boundaries vary and are larger for resources that are mobile or migrate (e.g., migratory birds) compared with stationary resources. Occasionally, spatial boundaries could be contained within the planning area boundaries or an area within the planning area. Spatial boundaries were developed to facilitate the analysis and are included under the appropriate resource section heading. The cumulative effects analysis for all topics included an analysis of cumulative effects at the planning area level.

4.22.2 Projects and Activities Considered

The following activities were identified as having the greatest likelihood to generate potential cumulative impacts when added to activities associated with the Wyoming Greater Sage-Grouse LUP Amendments alternatives:

- BLM and Forest Service land management plans and activities in adjacent planning areas
- Regional oil and gas development activities (e.g., exploration, production, and pipeline development)
- Regional recreation activities (e.g., hunting, OHV use, dispersed recreation)
- Economic development activities in Lincoln, Sublette, and Sweetwater counties.

Activities and development that occur within the CIAAs have the potential to create cumulative impacts on the specific resource being analyzed. Oil and gas development presents the highest likelihood for impacts within the planning area and in southwest Wyoming as a whole. Anticipated oil and gas projects within the planning area are encompassed by the oil and gas RFD for each BLM field office and Forest Service unit within the planning area. Mineral development and other actions that would create the potential for cumulative impacts are listed in Table 4-109. The projects listed in this table are not presented as an exhaustive list of actions, but every effort has been made to present a representative list of actions that could contribute to cumulative impacts.

Table 4-109. Summary of Other Activities Considered

Project Title	Project Description
Casper Field Office	
ADMB Project	This purpose of this project is to monitor causes of mortality and predation rates of Greater Sage-Grouse in the Bighorn Basin. The project will radio hens prior to nesting to locate nests and monitor using trail cameras. Project will also monitor habitat use by grouse.
Bates Creek Juniper Treatment	Reducing Juniper in sagebrush areas.
Bates Creek Watershed WUI	Multi-year ongoing project in coordination with WGFD for sagebrush burning.
Cheatgrass Treatments for Natrona and Converse Counties EA (2011)	The project authorizes the use of up 8 ounce/acre of Imazapic to control cheatgrass on up to 100,000 acres annually to benefit sagebrush obligate wildlife, including the Greater Sage-Grouse.
Converse County Oil and Gas Exploration EAs for Spearhead Ranch, Highland Loop, and East Converse	These are for horizontal exploratory drilling and include hydraulic fracturing. A combined total of 111 well pads/ locations with a range of 111 to 444 wells from the following EAs: Spearhead EA = 56 well pads/ locations with a range of 56 to 224 wells; Highland EA = 37 well pads/ locations with a range of 37 to 148 wells; and East Converse EA = 18 well pads/ locations with a range of 18 to 72 wells.
Denbury CO_2 Pipeline Project (EIS) (Casper, Pinedale, Rawlins, Rock Springs)	Denbury Green Pipeline – Riley Ridge, LLC (Denbury) has submitted ROW applications to the BLM to construct and operate a CO_2 pipeline system. One application is for approximately a 160 mile pipeline system ranging from 16-inch to 24-inch diameter CO_2 pipeline from the Riley Ridge Treatment Plant located in Sublette County, Wyoming to the Bairoil Interconnect Facility in Fremont County, Wyoming. The second proposal is for approximately an 83 mile 24-inch diameter CO_2 pipeline from the Bairoil Interconnect Facility to the Natrona Hub Interconnect Facility in Natrona County, Wyoming. At the Natrona Hub, the carbon dioxide will be transported through the Greencore Pipeline, authorized in 2011, to the Bell Creek Unit oil field in southeast Montana where it will be used for enhanced oil recovery. Approximately 85% of the proposed 243 mile combined ROW crosses federal public lands managed by five Wyoming BLM Field Offices – Pinedale, Rock Springs, Lander, Rawlins and Casper Field Offices.
Gateway West Transmission Line (Casper, Kemmerer, Rawlins, Rock Springs)	The overall Gateway West Transmission Line Project consists of the construction, operation, and maintenance of approximately 1,150 miles of high voltage, above-ground, alternating current power lines with a capacity of approximately 3,000 MW. An EA was completed in 2010, and EIS in 2011.
Greencore CO_2 Pipeline Project	CO_2 Pipeline Project 92% co-located within existing Cabin Creek Corridor. Begins in Eastern Fremont County and continues through Central Wyoming across state line into Montana (36% federal surface).
Hornbuckle 1 and 2 Oil and Gas Field Environmental Assessments	The action consists of drilling a maximum of 192 additional wells on the 48 well pads previously approved and evaluated in the original Hornbuckle EA. Under the Proposed Action, some of the existing 48 pads could be used to drill up to six horizontal wells per pad resulting in up to 192 additional wells.

Project Title	Project Description
Moneta Divide EIS	Rawlins Field Office and Casper Field Office intend to prepare an EIS regarding the proposed Moneta Divide Natural Gas and Oil Development Project. Proponent energy development companies (the companies) propose to develop up to 4,250 natural gas and oil wells within the proposed Moneta Divide Natural Gas and Oil Development Project area. The proposed development project area is located in Fremont and Natrona counties and encompasses approximately 265,000 acres of land, of which 138,000 acres are public land administered by the Lander Field Office. Approximately 31,500 acres of the project area are public lands administered by the Casper Field Office.
Zephyr Power Line (Casper, Kemmerer, Rawlins)	Chugwater to Las Vegas 500 kV Power line.
Kemmerer Field Office	
Bridger to Opal Pipeline Project	30 inch natural gas pipeline; ROW grant issued in 2006.
Coal Creek Riparian Enhancement Project	Kemmerer Field Office initiated an EA for a project to reduce sediment loading from Coal Creek Road (BLM Rd 4216). The project is located in Lincoln County near Cokeville, Wyoming. Eleven locations along Coal Creek have been identified for stream/riparian enhancements and sediment /erosion control.
Commissary Ridge Whitebark Pine Sanitation and Thinning	Remove infested whitebark pine in approximately 250 acres on Commissary Ridge (Lincoln County, Wyoming). This will also reduce the number of subalpine fir trees in the area.
Comprehensive Conservation Plan (CCP) for the Cokeville Meadows National Wildlife Refuge	USFWS is developing a CCP for the Cokeville Meadows National Wildlife Refuge.
CCP for the Seedskadee National Wildlife Refuge	Completed in 2002.
Dawson Uinta County 3D Seismic Project	This project is proposed to encompass approx. 61,320 acres of BLM lands that would include both Rock Springs Field Office and Kemmerer Field Office with the majority of lands falling into the Kemmerer Field Office boundary. There would be approx. 3,240 acres of National Forest System lands and 35,280 private lands within the project area. The project is located South of Mountain View, Wyoming. Vibe trucks, buggies and shot holes would be used to conduct this project. The EA is in process through a third party contractor.
Haystack Coal (State and Private)	Haystack Coal Company (HCC) plans to construct and operate a surface coal mine in northern Uinta County. It will be located 20 miles south of Kemmerer; two miles west of US Hwy 189 and eight miles north of I-80. The site is known to contain an estimated 70 million tons of surface coal. The coal pit area will include a coal preparation plant and an over-the-road truck load out and shop facility. HCC plans to produce to up to 3 million tons of coal per year. The life expectancy of the mine is estimated at 25 to 30 years.
Haystacks Geophysical Project	Geophysical operations in the Haystacks area. The project has been completed.
Livestock Trailing EA- South Trail Network	Kemmerer Field Office has initiated an EA to assess the impacts of livestock trailing and establish a process for issuing trailing permits for the south trails. The South Trail network is located south of interstate 80 to the Utah border.
Miller Mountain (Thrash) Exchange (EA) (Kemmerer, Pinedale, Rock Springs)	Proposed land exchange for parcels in Pinedale Field Office, Kemmerer Field Office, and Rock Springs Field Office with private lands.

Project Title	Project Description
Moxa Arch Infill Drilling Project	Proposal to drill 1,861 wells from 1,861 well pads to supplement existing production in the Project Area. The Operators anticipate drilling infill wells to the Frontier and Dakota Formations at densities ranging from 4 to 12 well pads per section in the proven production area and approximately 2 well pads per section in the flank area. Wells would be drilled conventionally (i.e., with vertical well bores from individual well pads). All proposed wells would be drilled during an approximate 10-year period after project approval. Although actual operations are subject to change as conditions warrant, the Operators' long-term development plan is to drill approximately 186 wells per year until the resource base is fully developed. The average life expectancy of a well is anticipated to be 40 years.
Overland Pass Pipeline Project (Kemmerer and Rock Springs)	Project will construct and operate a 760 mile pipeline to transport natural gas liquids from Opal, Wyoming to Conway, Kansas. Project completed in 2008.
Ruby Pipeline Project	675.2 miles of 42-inch diameter natural gas pipeline, along with associated compression and measurement facilities, located between Opal, Wyoming and Malin, Oregon. The EIS was completed in 2010.
Ryckman Creek Storage Field Project	Ryckman Creek Resources, LLC (Ryckman) proposes to convert an existing partially depleted oil field, known as the Ryckman Creek (Nugget) Unit (Unit), into a new interstate natural gas storage field. Ryckman is seeking certificate authority to develop, construct, own, operate, and maintain the Project approximately 15 miles northeast of Evanston in Uinta County, Wyoming.
Tokewanna Timber Sale	Salvage/sanitation harvest of the dead and dying lodgepole pine trees, a reduction of conifer encroachment in intermingled aspen stands, a commercial thinning of the intermediate-aged lodgepole pine stands, and a pre-commercial thinning of 20 year old stands of young lodgepole pine on approximately 373 acres in Sections 4 and 10, T. 12 N., R. 117 W. Uinta County, Wyoming adjacent to the WUI Tokewana Estates summer home area.
Trailing for South Trail in Kemmerer Field Office (EA)	In September 2012, the Kemmerer Field Office decided to move forward with an EA for Livestock trailing for the southern half of the field office, the South Trail complex.
USFWS Cokeville Meadows Withdrawal/Transfer	The USFWS has submitted a petition/application for a withdrawal and transfer of jurisdiction of public lands located within the boundary of the Cokeville Meadows NWR.
Williams Uinta to Opal Pipeline Project	Proposed 20-24 inch diameter, 240 mile natural gas pipeline from Uinta County, UT to Lincoln County Wyoming. The NEPA analysis has not been initiated.
Newcastle Field Office	
Teckla-Osage Transmission Line	A 240 kV overhead power line coming west from Rapid City, SD to Osage, Wyoming. The line will cross through the Newcastle core area but not on federal lands. Black Hills, NF is lead for the EIS. DDCT calculations show project under acreage and density guidelines.
Thunderbird Oil and Gas Transmission Pipeline	A 12 inch pipeline from Alzada, MT to Hulett, Wyoming that will essentially follow an existing corridor. A portion of the line will cross through defined sage-grouse connectivity habitat in Crook County. Montana BLM is the lead agency.
Pinedale Field Office	
"AccessYes" walk-in areas and hunter management areas (WGFD)	Private acreage listed under the walk-in program is increasing and often provides access to enclosed BLM lands, as well as the private lands that are enrolled in the program.

Project Title	Project Description
Anticline Electrification Phase I	The proposed project consists of approximately 16 miles of double circuit 25 kV distribution line and eight miles of other distribution lines. Located in the Pinedale Anticline from Gobblers Knob area down to Falcon Compressor area (DA's 2, 3, 4, and 5).
Aspen treatments	Project includes restoration of aspen communities, which will improve diversity and complexity of watersheds and provide a healthy environment for those dependent resources.
Boulder Landscape Plan	Project would include renewal of livestock grazing permits on 18 allotments covering 72,000 acres of public lands. Most of the Boulder landscape is located with sage-grouse Core Habitat Areas (90%). The landscape plan will consider wildlife habitat needs, including sage-grouse, as terms and conditions for livestock grazing permits are developed. No projects are currently included in the landscape plan.
Boulder South Communication Site	Project includes 150-foot cellular communication tower with 3 buildings. Located south of Boulder, just west of Highway 191. Project construction was planned to start in July 2011.
Boulder West Communication Site	Proposed project; construction would not start until the Boulder South and Daniel Communication Sites are completed. Project includes 80-foot tower and 2 buildings. Located off Sublette County Paradise Road.
CCP for the National Elk Refuge	USFWS is developing a CCP for the National Elk Refuge on the north side of Jackson, Wyoming. The 25,000-acre refuge includes nearly 1,600 acres of open water and marsh lands, 47 different mammals, and nearly 175 species of birds.
Countywide transportation development	Planning, development, reconstruction, and maintenance of the county road net in two counties in the planning area.
Colorado River cutthroat trout (CRCT) conservation population maintenance and enhancement project	Project includes the maintenance or restoration of watersheds, the spatial and temporal connectivity within and between watersheds, water quality or groundwater, and sediment regimes and transport.
CRCT passage and road drainage features	Project includes the reconstruction or removal of roads and drainages that pose risk to aquatic habitats, removal of culvert barriers, and removal of stream channel crossings.
Daniel Communication Site	Project includes 150-foot cellular communication tower with 3 buildings. Located just south of Ryegrass Road and approximately 2 miles west of highway 189. Construction was expected to start in the Fall of 2011.
Habitat Extension Services (WGFD)	Habitat treatments on private lands to benefit wildlife.
Jonah Cryogenic Plant	Cryogenic plant at terminus of the Jonah Field gas-gathering system.
Jonah 3D Geophysical Project	The Jonah 3D Seismic Survey project area is approximately 170 square miles (108,356 acres).
LaBarge Platform Exploration and Development (EIS)	The Pinedale and Rock Springs Field Offices are developing an EIS for the La Barge Platform Project for 838 new natural gas and oil wells from 463 new well pads (vertical and horizontal) over a 40-year project life span. Drilling expected to occur over a 10-year period in the Upper Green River Basin, in Sublette and Lincoln counties in western Wyoming. The project area consists of 218,000 acres of federal, state, and private lands. The area is one of the oldest oil and gas fields in the region, dating back roughly 100 years.
Miller Mountain Wind Project	Wind project; Type III status in 2011. On hold due to location within sage-grouse core habitat.
Native Fish Restoration (WGFD)	Restore native fish to traditional waterways on private, state, or WGFD lands.

Project Title	Project Description
PacifiCorp Point of Rocks to Rock Springs Transmission Power line Project	The project is completed.
Paradise 230KV Power line project	ROW grants for a 230 kV transmission line, a 69 kV transmission line, and two 8-acre substations to be located north of Paradise Road and south of the Jonah Gas Field. The EA was completed in 2009.
Paradise to Bird Pipeline Project	The ROW is pending. Pinedale Field Office lead.
Paradise North Distribution Power Line	Proposed 25kV single circuit power line from the Paradise substation to Shell's North Liquids Gathering Facility. Construction was planned for late summer/early fall 2011.
Quantum Geophysical Project	The project is completed.
Range-wide Three Species Conservation Agreement and Strategy	In progress. This plan will include the protection of habitat and populations of flannelmouth sucker, bluehead sucker, and roundtail chubs. Activities will be outlined in the plan that will decrease impacts from federal and state management actions.
Rendezvous Phase VI Pipeline Project	Proposal to construct and operate the Rendezvous VI Pipeline, the Mesa Loop Pipeline, and ancillary facilities. The proposal would allow for transportation of natural gas from the Pinedale Anticline Project Area (PAPA) to markets in southwest Wyoming. The EA was completed in 2008.
Rock Creek riparian exclosures and habitat improvements	In progress. Designed to enhance riparian habitat and water quality in the Rock Creek corridor, which contains a CRCT core conservation population.
Sage-grouse Conservation Plans	Prepared plans for recovery of the Greater Sage-Grouse.
Sublette Mule Deer Project (EA)	In response to declining mule deer numbers on the Pinedale Anticline and related ROD direction, is a series of habitat treatments to improve the quality and quantity of forage to enhance mule deer survival on and adjacent to the Anticline. Forecasted start date, September 1, 2013.
Warren Bridge Fish Habitat Structures	Completed/ongoing maintenance of instream structures that provide habitat for sport fish and native nongame fish species.
Wyoming Range Mule deer project (EA)	The Wyoming Range Mule Deer Habitat Project entails 40,000 acres of rangeland treatments in crucial winter and transition mule deer habitat. This effort was proposed to the BLM Pinedale Field Office in February 2012 in response to the Wyoming Range Mule Deer Initiative. Ten thousand acres are in the Rock Springs Field Office so the ID team includes specialists from both offices.
Rawlins Field Office	
Adobe Town Salt Wells Wild Horse Gather (Rawlins and Rock Springs)	Gathering and removal of excess wild horses from the Adobe Town and Salt Wells HMAs; completed in 2010.
Catalina PODs G and I	The Double Eagle Petroleum Company proposed 48 CBNG wells and three injection wells across 4,242 acres of federal, state, and private lands within boundaries of Atlantic Rim Project Area. Proposal also included new roads, pipelines, and utilities. Portions of the project within crucial winter range for pronghorn and mule deer.
Chokecherry/Sierra Madre EIS	The Power Company of Wyoming proposes 1,000 2-3 MW wind turbines, access roads, transmission lines and associated infrastructure across approximately 215,000 acres, including 100,000 acres of public land. Obama administration Priority Project to diversify the nation's energy portfolio in an environmentally responsible manner, in addition to being sited in an area that minimizes impacts to the environment. EIS volume I is the VRM planning amendment; volume II is the project analysis volume.

Project Title	Project Description
Continental Divide-Creston (CD-C) Natural Gas Development (EIS)	BP America Production Company main proponent, with 20 associated companies. Scoping was conducted in 2006. Proposed 8,950 wells across 1.1 million acres of mixed federal, state, and private land ownership. The project overlaps an area that has been producing oil and gas for decades.
Dead Ox Exclosure	The exclosure is designed to protect and enhance riparian plant communities and fishery habitats within an area in which sheep-to-cattle conversions occurred. The categorical exclusion (CX) was completed in 2011.
Desolation Flats Natural Gas Field Development Project (Rawlins and Rock Springs)	Conduct exploratory drilling and development of up to 592 wells during the next 20 years within the area known as Desolation Flats. The Desolation Flats Natural Gas Field Development Project area is approximately 233,542 acres and is located within the administrative jurisdictions of the BLM Rawlins and Rock Springs Field Offices in Sweetwater and Carbon Counties, south of Wamsutter, Wyoming. The EA was completed in 2003.
DKRW/Medicine Bow (EIS)	The Proponent is Medicine Bow Fuel and Power LLC. The Coal Gasification and Liquefaction process involves both coal mining (3.5 million tons yearly) and production of petroleum products from the coal, including gasoline (anticipated at 889,686 gallons per day). Originally filed with the Department of Energy (DOE) in 2005 to attempt to secure financing for the project, with DOE as lead agency. NOI for preparation of the EIS published by DOE in the Federal Register on November 27, 2009. Draft EIS prepared in March 2011, but not released for public comment. Proponent asked BLM to be lead agency in 2013 and will prepare a new Draft EIS to reflect a new purpose and need for BLM.
Gateway South Power line Project	500 kV alternating current overhead transmission line; 250 foot ROW width; 400+ miles long. EIS currently being prepared.
Hay Reservoir 3D Geophysical Project (Rawlins and Rock Springs)	The project is a 3D seismic operation on public lands in the Rock Springs and Rawlins Field Offices. The revised project area covers 279 square miles. The project is approximately 24 miles by 19 miles and covers approximately 178,560 acres. The EA was completed in 2003.
Hogback Ridge (Whirlwind 1) Wind Energy Project (EIS)	Whirlwind, LLC proposes to construct a wind energy facility consisting of 200-300, up to 2.75 MW wind turbines, with a goal of producing 450-700 MW of electricity on 50,000 acres of land, including 28,000 acres of BLM-administered land, southwest of Rawlins. The project area is located just west of the Chokecherry/Sierra Madre wind project. A Cost Recovery Agreement has been signed by the proponent. The proponent chose an area southwest of Rawlins, Wyoming as a primary site, based on wind potential, access to energy corridors, Interstate 80 and the railroad.
Lost Creek Uranium In Situ Recovery (EIS)	Approved project area of approximately 4,250 acres. No more than 324 acres would be subject to actual surface disturbance. Operations and start-up/closure will take an estimated 12 years total.
North Platte River Recreation Area Management Plan (EA)	A draft of the North Platte River Recreation Area Management Plan (RAMP) is currently being authored and is considering opportunities for action such as road improvements to access additional boat launches, boat ramp improvements, improvements of existing campsites, construction of a new boat-in campground, and maintenance and resurfacing of existing access roads. Recent public and agency meetings held in November and December of 2012 have generated strong support for the current proposed actions. The BLM has gained broad consensus from outfitters, interested agencies/municipalities, the general public, and internal specialists in establishing interest for which opportunities to pursue as proposed actions. The draft RAMP EA includes a set of Proposed Actions that are supported by the ID team and management. These Proposed Actions and a set of alternatives are currently being analyzed with an EA and other supplementary NEPA documents.

Project Title	Project Description
Northern Endurance/Barricade/Samson Road (EA)	Samson Resources Company and Mountain Gas Resources, LLC have notified the Rawlins Field Office, BLM of their desire to obtain a BLM ROW grant to construct a new access road, install one 16” and one 20” pipeline along the access road, construct two new compressor stations and install a high and low pressure loop pipeline in the Desolation Flats EIS project area, Sweetwater County, Wyoming.
Overland Pass Pipeline Project	Project will construct and operate a 760 mile pipeline to transport natural gas liquids from Opal, Wyoming to Conway, Kansas. Project completed in 2008.
RMP/VRM Amendment (EA)	VRM class decisions in the Rawlins RMP were remanded. Incorporates new VRM class decisions based on a new 2010 visual resource quality inventory. Approximately 3.5 million acres of public land surface and 4.5 million acres of federal mineral estate in Laramie, Albany, Carbon, and eastern Sweetwater counties. Chokecherry/Sierra Madre Wind Energy Development Project VRM (742,000 acres) excluded.
Sand Hills/JO Ranch ACEC (EA)	The Rawlins Field Office is currently drafting a management plan for the Sand Hills/JO Ranch ACEC. The purpose of the plan is to protect the unique vegetation complex, wildlife habitat values, and recreational opportunities of the ACEC as well as the cultural values of the historic JO Ranch property.
Sand Hills Wind Farm (EA)	Removed from the national priority project list in Spring, 2012. Is working with Game and Fish and Fish and Wildlife to get enough data to prepare their ABPP. Expected to complete data collection by Winter, 2013. Has changed project managers.
Table Rock EA (Rawlins and Rock Springs)	The proposed project involves development of up to 88 wells over 14 years: 33 shallow oil wells, 20 deep gas wells, and up to 35 water injection wells. Development of the EA is ongoing.
Trailing (EA)	Trailing NEPA, one for all cattle trailing and five specific analysis for sheep trailing areas.
Transwest Express Power line Project	600 kV direct current overhead transmission line, 700+ miles long. EIS has been initiated.
Upper Muddy Creek/Grizzly ACEC (EA)	The Rawlins Field Office is currently drafting the background, existing situation sections for the Upper Muddy Creek watershed SMA, with objectives and planned actions the next sections to write.
Rock Springs Field Office	
Baxter Natural Gas Exploratory Proposal EA	This is a proposal to drill two wells in the Little Mountain Area. The EA was completed in 2008 with one well drilled and one withdrawn.
Big Ridge Drift Fence	Project proposes to build a 4.9-mile fence constructed on Big Ridge on the south-west side of the Currant Creek drainage to stop cattle from drifting into Janes Meadow SUP and to facilitate rest from livestock grazing. The EA was completed in 2011.
Big Sandy and Little Sandy Rivers Riparian Exclosures	Designed to enhance riparian plant communities and fishery habitats as mitigation for sheep-to-cattle conversions.
Big Sandy Rock Sill	Provides artificial habitat for increasing fish populations in the Big Sandy River.
Bird Canyon Field Natural Gas Development (EIS)	Crown Energy and Koch Exploration Company are proposing new development in the existing Bird Canyon Field. Development consists of up to 371 new wells (234-Crown, 137-Koch) over 6-12 years with associated road development. The proposal is currently being revised.

Project Title	Project Description
Bitter Creek Shallow Oil and Gas Project	The project proposes to drill a maximum of 61 wells with an estimated 326 acres of total surface disturbance. The total project area encompasses approximately 17,961 acres: 11,768 acres are federal surface and minerals and 6,193 acres are private surface and minerals. The EA was completed in 2005.
Black Butte Coal Pit Expansion	The EA was completed in 2010. An application was not received for additional expansion of Pit 15.
Black Butte Coal Lease Modification	A modification to expand surface mining operations on 450 acres of federal coal lands was received April 2014.
BLM Wild Horse Gathers	BLM wild horse gathers from habitat management areas (HMA) in adjacent BLM offices.
Bone Draw	Designed to increase game fish populations in the Big Sandy River.
Big Firehole Canyon Fuel Treatment Project	The project proposes to conduct fuel treatments on 400 acres.
Browns Spring Fuel Treatment Project	The project conducted fuel treatments on 250 acres in 2011.
Copper Ridge Shallow Gas Exploration and Development Pilot Project	The proposal involves drilling, completing, and operating a maximum of 89 shallow gas wells and related production and water disposal facilities in the Copper Ridge Project Area. The project area includes a total of 24,953 acres. The CRPA overlies an area already developed by two existing oil and gas projects; the Brady and the Jackknife Springs Fields. The EA was completed in 2003.
Delaney Rim Wind Project	Wind project; Type II status in 2011.
Desolation Road Exploratory Gas Project	The project involves construction of an access road to two proposed well sites, one on federal land, and one on private land. EA in 2011.
Dickie Springs Placer Gold Exploration Project	The project proposes placer gold exploration activities on existing mining claims in the Dickie Springs area located within the administrative boundary of the BLM field office. The EA was completed in 2005.
Eden/Farson Irrigation Project	Furnishes an irrigation water supply for 17,010 acres in the vicinity of the towns of Farson and Eden in southwestern Wyoming. Project features include improvements to and maintenance of the reservoirs and drainage systems.
FMC Grange Optimization Project	Enhance solution mining capabilities at FMC Granger.
FMC's Proposed Haul Road	Proposed project consisting of a paved haul road, six pipelines, and one fiber-optic line from FMC's Westvaco mine/plant site to its Granger plant site. FMC is requesting a 400-foot wide corridor for construction, with 200-foot wide segments during operations with certain exceptions (i.e., cut and fill areas), and two bridges (to cross over the Union Pacific Railroad tracks and the Black's Fork River).
Great Divide Basin Wild Horse Gather	Gathering and removal of excess wild horses from the Divide Basin HMA; planned for 2011.
Green River RMP	Comprehensive land use plan focuses on similar resource issues and management to the south of the planning area. Green River RMP manages portions of the Pinedale planning area CIAAs for air, cultural, forestry, recreation, vegetation, VRM, watersheds, and wildlife management.
Henry's Fork Colorado River Salinity Project	The Natural Resources Conservation Service (NRCS) has developed this plan and EIS to reduce 6,540 tons of annual salt loading to the Colorado River system by implementing conservation practices in the upper Henrys Fork project area.

Project Title	Project Description
Hiawatha EIS	The Operators propose to drill as many as 4,208 new wells within the Project Area, which represents a full development scenario. Development of the EIS is ongoing.
HLI South Farson Area Water Well Project	Involves projects that enhance multiple uses of natural resources, including livestock grazing, farming, recreation, oil and gas production, historic values, and wildlife habitat within the defined area.
Horseshoe Basin 3D Seismic Project	A proposal to operate a combined heli-portable shothole/dynamite (60%) and vibroseis (40%) 3D seismic survey in Sweetwater County, Wyoming. The outside perimeter of the proposed survey area encompasses about 30 square miles (18,784 acres) including 28 square miles (17,894 acres) of BLM-administered land, 0.07 square miles (44.80 acres) of state land, and 1.32 square miles (844.80 acres) of private land. Completed in 2008.
Industrial Plant shut downs and overhauls	On a yearly basis, many of the Industrial Plants shut down a portion of their operations for overhauls. These shuts downs collectively can bring annually hundreds of workers into the County.
Jim Bridger Flue Pond Expansion Project	The project is completed.
Jim Bridger Power Plant	Retrofits to power plant units to accommodate EPA Haze rules
Jim Bridger Power Plant 3D Seismic Project	The proposed action is to conduct three-dimensional (3-D) and electromagnetic (EM) geophysical exploration in Sweetwater County, Wyoming. The project area covers approximately 39,588 acres of federal, state, and private land. Completed in 2010.
Jim Bridger South Wind Project	Wind project; Type II status in 2011.
Kinney Rim Wind Project	Wind project; Type II status in 2011.
LaBarge Platform Exploration and Development (EIS)	Pinedale and Rock Springs Field Offices developing an EIS for the La Barge Platform Project for 838 new natural gas and oil wells from 463 new well pads (vertical and horizontal) over a 40-year project lifespan. Drilling expected to occur over a 10-year period in the Upper Green River Basin, in Sublette and Lincoln counties in western Wyoming. The project area consists of 218,000 acres of federal, state, and private lands. The area is one of the oldest oil and gas fields in the region, dating back roughly 100 years.
Leucite Hills Samson Project	This project involves a preliminary proposal from Samson to drill 25 wells within the project boundary. The EA has not been initiated.
Little Monument Natural Gas Project	Burlington proposes to drill, complete, and produce approximately 31 additional wells at 8 or more wells per section within the LMPA over the next 3 years. The EA was completed in 2004.
Little Red Creek Fuel Treatment Project	The project conducted 400 acres of fuel treatments in 2010.
Lonesome Bronco Wind Project	Construction of 89 wind turbines. POD not received. Type II status in 2011.
Luman Rim EA	The proposed action is to drill 58 additional natural gas wells in the Luman Rim area of north central Sweetwater County, Wyoming. The EA was completed in 12/2010.
Marianne 3D Seismic Project	The project conducted 3D geophysical exploration in the Horsethief Canyon and Bitter Creek area (Marianne 3-D Project) on federal, state, and private lands in Sweetwater County, Wyoming. The project area covers approximately 59.37 square miles or slightly less than 38,000 acres. The EA and the project were completed in 2009.

Project Title	Project Description
Monell Arch Development (EA)	Proposal submitted by Anadarko Petroleum Corporation to infill drill additional oil and gas wells in the Monell and Arch Units to facilitate product extraction, maximize the economic recovery of the resource, and extend the production life of the units. The Monell Arch area is located in southwestern Wyoming, and is comprised of 22,657 acres of mixed federal, state, and private surface lands and 22,658 acres of mixed federal and state mineral lands in Sweetwater County. The operator has proposed approximately 105 new oil wells, 18 CO_2 injector wells and two water injection wells that would be drilled within the project area.
Monell CO_2 Pipeline Project	Proposed 32.7-mile Monell CO_2 Pipeline. The purpose of the proposed pipeline is to transport CO_2 gas from an existing valve terminal that is part of the Exxon/Mobil Shute Creek CO_2 Distribution Pipeline System to the existing Monell Federal Unit Oil Field (Monell Field) and inject it to liberate some of the remaining oil resources from the existing oil field for tertiary recovery. The EA was completed in 2003.
Monell Enhanced Oil Recovery Project	Anadarko proposes to drill a maximum of 126 wells. The EA was completed in 2005. Drilling began in 2006 and was planned for approximately three to six years.
National High School Rodeo	Rock Springs Event Complex July 2013, 2014, 2015, potential increase in demand for motel rooms and R.V. spaces.
North Dutch John 2D Seismic Project	Geophysical operations consisting of a 2D seismic survey for oil and gas resources in the BLM Rock Springs Field Office was proposed by Azalea Oil Company, LLC (Azalea). The survey would consist of three seismic lines totaling 10.5 linear miles. The EA was approved in 2010; the project has not been completed.
NPL (Normally Pressured Lance) Project	The NPL Project Area, located about 68 miles northwest of Rock Springs, Wyoming, covers approximately 141,000 acres administered by the BLM Pinedale Field Office and Rock Springs Field Office. For all project components, the estimated total initial surface disturbance is estimated to be about 6,625 acres, or 4.7% of the NPL surface acreage. Up to 3,500 new wells would be drilled over a 10-year period starting in March 2013 at an average rate of up to 350 wells per year. Outside of the sage-grouse Core Area, drilling would occur on an average of four centralized, multi-well pads per section. Inside the sage-grouse Core Area, drilling would take place from one multi-well pad per 640-acre area (not section). Each multi-well drilling and completion pad would encompass up to approximately 18 acres per location and would support between 1 and 64 wells.
Pacific Rim Shallow Gas Exploration and Development Project	Project proposes to drill a maximum of 120 wells. The EA was completed in 2004.
Pine Mountain Wind Project	Wind project; Type II status in 2011.
Pit 14 Coal Lease	1,399 acres leased for coal development. The EIS was completed in 2007.
Puma Deep Prospect Area Gas Development Project	Davis Petroleum Corporation proposes to construct, drill, and complete 10 wells in addition to the five already existing wells on the 8,800-acre federally-administered minerals. The EA was completed in 2009.
OCI Railspur	Proposed Railroad route. The NEPA analysis was completed in 2010.
Overland Intertie Power line	550 mile overhead high voltage power line proposal; construction planned to be completed by 2014. The NEPA analysis has not been initiated.
Overthrust Loop Pipeline Project	Line in service in 2010.

Project Title	Project Description
Overthrust Wamsutter Expansion Pipeline Project	Overthrust is proposing to install approximately 77.2 miles of new 36-inch-diameter natural gas pipeline facilities, two compressor stations, two receipt points, one delivery point, and three block valves, located within Lincoln and Sweetwater Counties, Wyoming. The NEPA analysis was started in 2007.
Quantum Adobe Town 2D Geophysical Project	Conduct 2D geophysical operations along a 6.82-mile line. The EA was completed in 2002.
Rock Springs RMP Revision (EIS)	Revise Green River RMP; begin Comprehensive Transportation and Travel Management (CTTM) Plan to be incorporated into the RMP. Projected public release of Approved RMP/ROD: 2/12/2016.
Rubicon 3D Seismic Project	The project conducted geophysical exploration operations consisting of heli-portable 3D seismic surveys for oil and gas resources. The EA was completed in 2008 and the project has been partially completed.
Simplot Power line Mechanical Fuel Reduction Project	The project conducted mechanical fuel reduction efforts on 18 acres for power lines planned for 2010 and 2011.
Simplot - Reliability Project	Expansion to increase plant capacity.
Simpson's Gulch 3D Vibroseis Project	Vibroseis 3D geophysical project, covering 107 square miles in Sweetwater County, Wyoming. The EA was completed in 2004.
South Jonah 3D Vibroseis Project	The application covered 410 square miles in Sweetwater and Sublette Counties, Wyoming. The EA was completed in 2002.
Sweeney Ranch Wind Project	The project involves constructing a wind development project with a maximum of 119 wind turbine generators within the Rock Springs Field Office boundary. Wildlife surveys were initiated in 2010/2011.
Sweetwater Wind Project	Wind project; Type II status in 2011.
Ten Mile Rim Coal Lease	Coal lease on the Ten Mile Rim Tract (WYW-154595); includes 2,242.18 acres of federal coal lands. The EA was completed in 2004.
Tommy James Basin Sand and Gravel Sale	The proposed action would authorize the sale of 150,000 tons of sand and gravel from an area of approximately 10 acres including access in the Tommy James Basin of Sweetwater County. The EA was completed in 2008.
Vermillion Basin Natural Gas Exploratory and Development Project	Proposal to drill up to 56 natural gas wells in and around three existing, producing oil and gas units (Trail, Kinney Rim, and Canyon Creek). The EA was completed in 2002.
West Flank (Wild Bunch) 3D Geophysical Exploration Project	3D geophysical project, known as the West Flank (Wild Bunch) 3-D Vibroseis Project, covering 211 square miles in Sweetwater County, Wyoming. The EA was completed in 2004.
White Mountain Little Colorado Wild Horse Gather	Gathering and removal of excess wild horses from the White Mountain Little Colorado HMAs; planned for 2011.
White Mountain/Teton Wind Project	Construction of up to 240 turbines on White Mountain just northwest of Rock Springs. The project area encompasses approximately 13,165 acres, including 4,398 BLM-administered acres. The EA was nearly completed in 2011; waiting on USFWS and Avian Protection Plan. Type III status in 2011. Teton Wind Energy has proposed a commercial wind energy facility to be built on White Mountain. A revised proposal will consist of 52 turbines, access roads, gathering lines, transmission line and O and D Building. A revised final POD has not been submitted.
Bridger-Teton National Forest	
Authorization to use wheeled, motorized vehicles year-round on Fall Creek Road - Triple R Ranch, LLC CE	Triple R Ranch, LLC is proposing to drive wheeled, motorized vehicles year-round on Fall Creek Road from Red Top Meadows (Forest Service#31000) to their ranch to reach private property. They are also requesting to plow the road and do routine maintenance.

Project Title	Project Description
Clark Draw Riparian Exclosure	Construction of approximately 400 feet of fence along Clark Draw to exclude cattle for a segment of stream.
Continental Divide National Scenic Trail Reconstruction Project – Sheridan Pass to Forest Road 534 CE	The Forest Service is reconstructing and relocating short sections within a 13-mile segment of the Continental Divide National Scenic Trail. Implementation began summer of 2014.
Desert Homestead Road Easement & Water Development Authorization CE	Road easement authorization for Desert Homestead Road and Ditch Association (4 private inholdings) located 4 mi. northwest of Lower Green River Lake. SUP authorization for existing headgate, ditch, and above-ground pipe within Osborn Ditch1. Implementation began summer of 2014.
Dime and Mystery Lakes Fisheries Project EA	Authorize Wyoming Game and Fish Dept. to use rotenone to remove introduced trout species from Dime Lake and Mystery Lake in the Teton Wilderness.
Expansion of Winter Parking in Alpine	Extend the existing winter parking lot at the greys River Rd. at the Forest boundary in Alpine.
Exxon/Mobil Lake Ridge Well EA	Authorize a Surface Use Plan of Operation to drill one natural gas exploratory well on an existing unit and lease.
Exxon/Mobil North Lake Ridge Unit, Exploration Well No. 1-34 EA	Authorize a Surface Use Plan of operations to drill one natural gas exploratory well on an existing unit and lease.
Upper Gros Ventre Riparian Enhancement (formerly Fish Creek Stabilization and Wildlife Enhancement)	Reconnect abandoned river meanders of the Gros Ventre River.
Fontenelle Fire Fence Reconstruction Project CE	Reconstruction of about 15 miles of the boundary and pasture fence that were damaged in the 2012 Fontenelle Fire. Trees that pose a safety threat or are susceptible to falling on the fence would be cut.
Fontenelle Fire Timber Salvage EA	Harvesting fire killed trees on approximately 1,200 acres from the Fontenelle fire of 2012 and opening two gravel pits for road surfacing material.
Grazing Authorization for Muddy Creek, Temple Creek and Bunion Creek Allotments	Propose to reauthorize sheep grazing on three allotments in the southern portion of the Wind River Range. The area covers approximately 46,600 acres and the dominant vegetation is mountain big sagebrush.
Grazing Authorization for Sweetwater, Blucher Creek and East Squaw Creek Cattle and Horse Allotments	Propose to reauthorize cattle and horse grazing on three allotments in the southern portion of the Wind River Range. The area covers approximately 33,800 acres and includes sage-grouse habitat.
Green River Corridor- Recreation and Watershed Enhancement Project EA	Inventory, development, and implementation of a management plan to address resource concerns regarding dispersed recreation use and roaded access within the Green River corridor; including camping restrictions and travel management updates. Planning area includes sage-grouse habitat.
Grouse Mountain Area Vegetation Management EA	Thinning competing trees and/or prescribed fire to investigate enhancement of whitebark pine survival and regeneration on 400 acres within the upper Spread Creek drainage.
Hams Fork Vegetation EA	Project addresses hazardous fuels; safety hazards associated with standing dead trees; the vitality of aspen, whitebark pine, and lodge pole pine; and recovery of merchantable value of beetle-killed timber. Implementation began summer 2014.
Hobble Creek Road Crossing CE	The Kemmerer Ranger District proposes to replace an existing ford with a bridge on Hobble Creek and install fish-friendly bank stability structures upstream to protect the newly built road structure.

Project Title	Project Description
Horse Creek Riparian Restoration Project	Proposed project would remove road fill and culverts from the end of Forest Service Road 10112 to reduce negative impacts and improve stream function.
Jackson Hole Mountain Resort Suite of Projects	Creation/improvement of mountain features/facilities including ski runs, lifts, snow making, avalanche control, and summer trails.
Kemmerer Grazing and Rangeland Vegetation Management EIS	Authorization of grazing on 16 sheep allotments: Porcupine, Lower Salt, Buckskin Knoll, Lake Alice, Smiths Fork, Aspen Springs, Basin Creek, Devil's Hole, Elk Creek, Green Knoll, Indian Creek, Lake Mountain, Pole Creek, Sams Allen Creek, So. Fontenelle, and Spruce Creek. Project is on hold.
Labarge Vegetation Restoration EA	Combination of mechanical treatments and prescribed fire to restore conifer encroached aspen stands, restore white bark pine stands, and salvage bug-killed timber. The 2012 Fontenelle Fire burned within the project area. Conditions are being assessed. An EA and draft decision are expected in 2015.
Lower Valley Energy - Lot 86 – Power line Burial CE	Burial of 68' of power line to bring power from National Forest System lands to private property. A trench that is 68' long, 24" wide and 42" deep will be dug to bury the line. A vault will be installed on National Forest System lands to carry the power from an existing primary conductor.
Maki Creek Trail Bridge	The Forest Service proposes to construct a bridge for hikers on the Maki Creek trail.
Oil and Gas Leasing Decision -- 44,720 Acres in the Wyoming Range -- Supplemental Analysis EIS	The January 2011 decision not to authorize BLM to lease the acres at this time has been withdrawn to allow further analysis and consideration. Supplemental analysis and decision expected in 2016.
Pinyon Osborn Vegetation Treatments EA	Mechanical and prescribed fire treatments to reduce and restore shrub, aspen, and conifer fuels along the Upper Green River Corridor. This decision was reversed on appeal. Currently collecting data in preparation for analysis.
Proposal to Authorize a Relay Race for Epic Relays on National Forest System Lands for 5 years CE	Epic Relays would like to hold a running relay race for up to 100 teams on the 2nd Saturday in August along the Snake River Canyon from Alpine, Wyoming to Fall Creek Rd and then along Fall Creek Rd for approximately 9 miles.
Reauthorization and Management of Cattle Grazing on the Little Greys Allotment EA	The September 2009 decision to reauthorize livestock grazing on the allotment was reversed on appeal; NEPA on hold; grazing continues.
Sherman Cattle and Horse Grazing Allotment EIS	Reauthorization of livestock grazing on approximately 17,370 acres. Implementation began summer of 2014.
Greater Snow King Area Trails (formerly Skyline Trail/Putt Extension)	Trail construction, reconstruction, and changes in use involving the Putt-putt trail, KC and Josie's Ridge trails, and Game Ck. trail; construction of Skyline trail and extension of Putt-putt trail.
Skyline WUI Fuels Reduction EA	Proposed fuels reduction treatments using equipment, prescribed burning and a combination of treatments. The treatments would reduce the risk of high severity wildfire and increase public and firefighter safety in the event of a wildfire. Planning area includes sage-grouse habitat.
Snake River Headwaters Wild and Scenic Comprehensive River Management Plan (CRMP) EA	A Plan to describe Outstanding Remarkable Values (ORV); define River Corridor Boundaries; create Goals, DFCs, Standards and Guidelines; amend Forest Plan as necessary. EA expected April 2013.
Snow King Mountain Rafferty Lift Replacement and Ski Trail Construction	Replacement and realignment of the Rafferty lift and construction of two associated intermediate ski trails.
Snow King Mountain Aerial Adventure Course	Ropes course and treetop challenges including swinging bridges, nets, and zip lines.

Project Title	Project Description
South Cottonwood Creek Road and Trailhead Flood Damage Restoration CE	Realign the stream channel in order to reduce flooding of the road and trailhead at South Cottonwood Creek.
Squaw Creek Water District Test Well CE	Construct and pump test a water well that will be 600' deep x 6.25" in diameter to provide potable water to 72 homes within the Squaw Creek District.
Star Valley Front Vegetation Management CE	Prescribed burning and mechanical treatment of vegetation to restore a balance of age classes in the mountain shrub, big sagebrush, aspen, and conifer woodlands.
Trail Construction/Reconstruction Near Star Valley Ranch	Construct or reconstruct about 6.5 miles of non-motorized trails in Prater Canyon, Green Canyon, and Cedar Creek Canyon area and enhance two trailhead parking areas.
Teton to Snake Fuels Management EIS	Fuels management, such as, prescribed fire and cutting and thinning of vegetation for fire hazard reduction and restoration/maintenance of fire adapted ecosystems. Analysis type changed to EIS in 2013.
Trail Projects on the Buffalo Ranger District CE	Realignment and reconstruction on Divide Lake Trail; puncheon and bridge replacement on the North Buffalo Trail; relocation on the Pilgrim Creek Trail.
True Oil - Lander Peak Exploration Project EA	True Oil has submitted the Lander Peak Exploration Proposal which proposes two exploratory wells -- one from an existing pad and one from a reclaimed pad location.
Upper Green River Area Rangeland EIS	Forest Service proposes to reauthorize livestock grazing on six allotments containing about 170,600 acres and includes sage-grouse habitat. A Final SEIS and draft decision are expected in 2015.
White Pine Communication Site Building and Tower Construction CE	Construction of communication site building and tower, in addition to existing tower at White Pine Communication Site. Implementation began summer of 2014.
Wyoming Game and Fish Commission Alkali Creek Feedground EIS	Long-term (up to 20 year) authorization for the Wyoming Game and Fish Commission to continue to use the facilities at the Alkali feedground on National Forest System land to conduct winter elk feeding and related management programs. The Final SEIS and draft decision was released in January 2015.
Medicine Bow National Forest	
3Cs Guiding-Snowmobile Guiding Service	Five-year temporary permit to operate a snowmobile guide service on the Laramie and Brush Creek/Hayden Districts of the Medicine Bow NF. Implementation date December 2012.
Battle Mountain Prescribed Burn	Prescribed burn to regenerate aspen in conifer-encroached aspen stands, re-introduce fire into a fire adapted ecosystem in the far southwestern portion of the Sierra Madre Range. June 2015.
BCH Platte River Ditch Bill Easements	Issue FLPMA easements for irrigation ditches and reservoirs meeting Colorado Ditch Bill criteria located in the Platte River drainage on the Brush Creek/Hayden Ranger District. Implementation On Hold.
Bow River Administrative Site Conveyance	Sale of Administrative Site Facilities. T18N., R80W., sec 21 NE1/4NW1/4. Bow River Administrative Site Brush Creek/Hayden Ranger District. On Hold.
Bridger Peak AML Mine Site Reclamation	Reclamation of two abandoned mine sites located within the Sierra Madre/Encampment Mining District. Project is part of Wyoming Abandoned Mines Safety Program. T18N, R81W, Section 26. Ditch is located on the BCH District within the Platte River drainage on the west side of the Snowy Range. Implementation date October 2012.

Project Title	Project Description
Divide Peak Prescribed Burn	This project includes prescribed burning of 1236 acres of shrub land and 422 acres of aspen at T15-16N, R85-87W on the north end of the Sierra Madre Range. DDCT was completed and approved in 2014.
Friend Creek Fuels Reduction	State of Wyoming. T 27 N, R 72 W, Sections 7, 8, 17, and 18 (Round Mountain, Friend Creek drainage). The project will reduce hazardous fuels on 600 acres, in the WUI. The treatments include mechanical thinning and prescribed fire. Summer 2013 on portion not affected by Arapaho fire.
Gateway West 230/500 kV Transmission Line Project	Idaho and Rocky Mountain Power have proposed to construct electric transmission lines from the proposed Windstar Substation near the Dave Johnson Power Plant at Glenrock, Wyoming to the proposed Hemingway substation near Melba, ID. Planned Implementation June 2015.
Gunnysack and Cow Creek Mountain Permanent Repeater Sites	Install permanent repeaters to provide radio coverage for the Laramie Peak Unit. Repeaters are a 8' X 8' X 7' metal building to house the equipment, 2 solar panels and a 20 foot boom antenna. This would include a helispot for each repeater site. T30N, R76W, Section 20 (Gunnysack and Cow Creek Mountain). Implementation date was August 2010.
Invasive Plant Management EIS for the Medicine Bow – Routt National Forests and Thunder Basin NG	States of Colorado and Wyoming, including the counties of: Garfield, Grand, Jackson, Moffat, Rio Blanco, Routt, Albany, Campbell, Carbon, Converse, Crook, Natrona, Niobrara, Platte, and Weston. This proposal would allow the aerial application of the herbicides Plateau and Journey to treat infestations of cheatgrass acres on the Medicine Bow-Routt National Forest and TBNG. Planned implementation is June 2015.
Johnson-Takala Ditch Permit	Issue a SUP to valid water right holders for use of the Johnson-Takala ditch, an existing facility used for agricultural irrigation purposes on BCH District. Conjectured implementation date was April 2013.
Jones Outfitting	Jones Outfitting has requested a renewal of their current authorization to guide hunting excursions on Sheep Mountain and the Snowy Range. This new authorization would be for a five-year term expiring in 2017. Implementation date December 2012.
Laramie Pre-commercial Thinning Analysis	The Laramie Ranger District is reviewing potential thinning needs outside of Lynx analysis units. T 14, 13, and 12. R 77, 78, 79, and 80. Laramie Ranger District Snowy Range area. Conjectured Implementation date March 2014.
Northeast Laramie Range Fuel Reduction Project	This project proposes to burn or mechanically treat approximately 2,708 acres in the eastern half of the Laramie Peak unit. Much of the vegetation in the project units has not experienced fire in the past 50 years. Planned implementation is June 2015.
North Laramie Range Aspen Restoration	This project would incorporate treatments aimed at regenerating select aspen stands and associated habitat on the Laramie Peak Unit of the Douglas Ranger District. Treatments will focus in improving the health and condition of aspen stands. Planned implementation is June 2015.
Parsons Creek Land Exchange	Proposal to exchange lands in the Warbonnet Peak area of the Laramie Peak Unit. T 28-29 N, R 74-75 W (Warbonnet Peak area). This project is on hold.
Red Park Prescribed Burn	Prescribed burn approximately 60 acres to regenerate/restore ponderosa pine populations and regenerate aspen where it exists. T17N R82W NE 1/4 Sec 25. Western slope of the Snowy Range. Implementation On Hold.
Rock Creek Fence Construction Project	Project was implemented in June 2007. T29N, R76W, Section 28. The project is a 0.75-mile fence.

Project Title	Project Description
Savery	Vegetation management to salvage timber/regenerate forests, reduce increasing fuel loads/decrease potential fire hazard, remove dead and dying trees posing a public safety hazard in high priority areas. Includes travel management and recreation management T12-16N, R85-88W. Sierra Madre portion of Brush Creek/Hayden Ranger District, north of Battle Highway. Conjectured implementation date July 2013.
Travel Management	State of Wyoming. Travel Management for the MBNF is in progress. This project covers the entire unit. The Decision includes: opening trails/roads, closing trails/roads, converting roads to trails, decommissioning trails/roads, seasonal closures for trails/roads, and constructing trails/roads. Implementation is ongoing.
Travel Management Laramie Peak	State of Wyoming. Travel Management for the Laramie Peak Unit is complete. This project covers the entire Laramie Peak Unit. The Decision includes: opening trails/roads, closing trails/roads, converting roads to trails, decommissioning trails/roads, seasonal closures for trails/roads, and constructing trails/roads. Implementation is ongoing.
West Snowy Range Travel Management	Travel Management for the northwest Snowy Range T14-19N, R79-82W. Analysis includes: opening trails/roads, closing trails/roads, converting roads to trails, decommissioning trails/roads, seasonal closures for trails/roads, and constructing trails/roads. Implementation begins summer 2015.
Thunder Basin National Grassland	
Antelope Mine Rail Spur Expansion	W ½, SW ¼, Section 1; W ½, Section 12; W ½, Section 13; SE ¼, SE ¼, Section 14. Antelope Coal LLC has requested an authorization to amend the existing Antelope Mine SUP to allow expansion of the railroad spur area associated with expansion and increased capacity of the coal load-out facility. Implementation was Spring 2013.
Ballard Petroleum Holdings, LLC APDs Forest Service Fed-14-22TH and Fed 14-23 TH wells	Ballard proposed to conduct surface use operations associated with accessing, drilling, testing, and completing two horizontal wells located on National Forest System lands. Conjectured implementation is July 2015.
Ballard Petroleum Holdings LLC, Wild horse Federal #14-18	This project would allow for construction of one conventional oil well approximately 260 X 360'. If the well produces oil, then the disturbance would be 0.5 acres. There would be no road construction or reconstruction. Implementation was in late 2011.
Ballard Petroleum Road Use Permit for NFSR910C	Use of NFSR910C including reconstruction of 4717 feet of road and use of 2283 feet of additional road. Conjectured implementation of April 2015.
Baytex Stoddard Road Use Permit #40770	Baytex Energy is proposing to use and improve an existing 2-track NFSR for approximately 0.7 miles from the intersection with Weston County Road – Cheyenne County Road (#54) to the north in the Section 35 T 42N, R 64W on the TBNG. Implementation was August 2013.
Berenergy Corp Road Reconstruction	Use of approximately 0.6 mile of NFS Road 935 for year round access to their existing oil and gas lease operations in Manning Oil Field. Implementation January 2015.
Big Porcupine Coalbed Methane	T42N, R71W, Sections 11-13, 22-24 and 34-35. This project included drilling 202 CBM wells and constructing the related facilities. The name was changed to Independent Energy CBM-260 well APD. Number of wells has increased to 260. Approximately 186 acres of national Forest Service land was disturbed. Implementation was in Summer 2005.
Black Hills Bentonite Exploration Drilling	Portions of T 47 N, R 63 W. Black Hills Bentonite, LLC (BHB) will conduct exploration drilling for the purpose of mapping/documenting the subsurface distribution and quality of bentonite deposits. Approximate total land area to be disturbed will be < 0.01 acre. Project not implemented.

Project Title	Project Description
Black Hills Exploration Grieves Oil Wells	T42N, R64W, Section 30. This project allowed creation of 2 oil wells. The impacted acreage was approximately 3 acres. Implementation was in September 2006.
Black Hills National Forest and TBNG Power 230Kv Line	TECKLA-OSAGE-LANGE 230Kv Transmission line. Implementation projected for June 2015.
Black Thunder Mine Topsoil and Overburden Stockpile	Thunder Basin Coal Company's Black Thunder Mine (BTM) has requested an authorization to occupy National Forest System lands for the purpose of constructing and storing topsoil and overburden stockpiles. The proposed project area lies immediately adjacent to BTM's existing lease and within the West Highlight Coal Lease by Application (LBA), which has been analyzed for potential environmental impacts under the Wright Area EIS. Implementation date 2011.
BNSF Kara Thornton (railroad)	T48N, R66W, Sections 3, 4. BNSF Kara Thorton proposed construction of a second main track, which resulted in 4.77 acres (25-30' x 7,199') of disturbance on National Forest System lands. The project includes: grading, laying track, and adding signals. Implementation date 2009.
BNSF Reno Junction and Logan Hill (railroad)	T42N, R71W, Section 34. The 4th line construction at Logan Hill includes 44.48 acres (25-100' x 50,182). Construction of ingress/egress at Reno Junction disturbed approximately1.62 acres (20-35' x 1,447'). Implementation date 2009.
BNSF Snow Fence Project # 39835	Authorize BNSF Railway Company to construct and maintain snow fences to protect their railroad easement on National Forest Service land north of Douglas, Wyoming. Implementation date November 2012.
Charger Resources APD for Tuit Draw Federal 11-2PH Well	Surface Use Plan of Operations associated with accessing, drilling, testing, and completing a horizontal oil/gas well. Includes approx. 886 feet of new road, 400' x 400' well pad for a total disturbance of 6.4 acres. Conjectured implementation date of August 2015.
Charger Resources APD for Porcupine Federal 44-19 TH and 44-19PH	Surface Use Plan of Operations associated with accessing, drilling, testing, and completing a horizontal oil/gas well. Includes approx. 151 feet of new road, 400' x 400' well pad. Conjectured implementation date of September 2015.
Charger Resources, LLC Special Use Permit	Special use authorization for off lease activities associated with accessing, drilling, testing, and completing a horizontal oil/gas well. Conjectured implementation date of March 2015.
Chesapeake Energy Corp. Road Use Permit # 35930	The proposed action is to authorize the construction of a road by the Chesapeake Energy Corporation. Chesapeake Energy Corp. is proposing to build 784 feet of new road to access an oil well. Implementation Fall 2011.
Chesapeake Energy Road Use Permit NFSR 964 # 36700	The proposed action is to authorize Chesapeake Energy to reconstruct and use approximately 10,113 ft. of NFSR 964 to access three proposed oil wells in the Robbins Unit and one proposed well in the Cottonwood Unit. Implementation Fall 2011.
Coleman Oil and Gas Coalbed Natural Gas Well Plan of development (Antelope Flats)	T41N, R72W. One oil well, 1000' underground utility corridor, 2 track 16 wide and one drilling pad 100'X100'.6 acres. Implementation was in Fall 2005.
Converse County Oil and Gas EIS Project	Development of oil and gas resources as identified including approximately 5,000 wells on 1500 well pads across all jurisdictions in the project area. Conjectured implementation December 2017.

Project Title	Project Description
Dakota, Minnesota, and Eastern Railroad	Location is T41N, R63W, Section 8, 9, 17, and 18; T41N, R64W, Section 10; T42N, R65W, Sections 19, 22, 26, 27, and 35; T42N, R66W, Sections 23 and 24; T42N, R68W, Sections 1-4; T43N, R69W, Sections 29, 33-34. 800 acres are on National Grassland. Construction of the line with facilities may take 5 years and up to 50 year permit for operation of a railroad. Temporary construction is for 240' width. Relocation of part of School Creek Road is part of the project. Creation of wetland as mitigation measure is also included. Implementation pending.
DCP Douglas, LLC Natural Gas Pipeline to EOG Well # 37478	DCP will construct two 4-inch natural gas pipelines; one high pressure steel line, one low pressure poly pipe, to the EOG-Arbalest 53-33H well to tie into their existing 4inch high pressure line. Less than 5 acres of National Forest System lands. Implementation Winter 2012.
Devon Energy Sor Kraken 3D Seismic Survey	NOI to conduct 3D Oil and Gas geophysical operations across 6188 acres including limited use of shot holes in inaccessible terrain. Conjectured implementation September 2015.
DM&E Wetland Mitigation Sites	T40N, R68W, Section 20. Mitigate wetlands lost during railroad construction. This includes shallow excavations at 3 sites along Antelope Creek to create wetland habitat. Includes temporary work sites, and uses existing roads. The project includes 16 acres of excavation. Conjectured implementation date is on hold.
Dowdy Road Permit DGL347	Luke Dowdy has requested authorization to cross National Forest System land to access his private land in the Upton area. He will build a new road located in T47N, R64W, sec. 17, SE¼SE¼. Mr. Dowdy owns the private land in the same quarter section. The ROW will be for approximately 15 feet in length and 20 feet wide, 10 feet from center line. Implementation Summer 2012.
EOG Resources Inc. Road Permit # 36701	The Forest Service authorized EOG Resources, Inc. to use portions of NFSRs 910, 910.D and 910.A and construct approximately 719 feet of new road in Section 18, and 190 feet in Section 15, T41N, R72W 6th PM to access proposed wells. Implementation Fall 2011.
Four Corners Petroleum APDs WFCU#22 and WFCU#84	Surface Use Plan of operations for accessing, drilling, testing, and completion of reentry wells for previously producing wells that were plugged and abandoned. Conjectured implementation November 2015.
Geokinetics Alta 3D Geophysical Project # 36909	The project will encompass approximately 634 square miles with approximately 120,480 acres of the TBNG included in the project area. The project is proposed as a multi-source geophysical vibroseis with some shot holes. Implementation of phase I was in January 2011. Phase II has been cancelled.
Geothermal Leasing Environmental Impact Statement	The BLM and Forest Service are preparing a joint Programmatic Environmental Impact Statement to analyze the leasing of BLM and National Forest System lands with moderate to high potential for geothermal resources in 11 western states.
Invasive Plant Management EIS for Medicine Bow-Routt National Forests and TBNG	States of CO and Wyoming, including the counties of: Garfield, Grand, Jackson, Moffat, Rio Blanco, Routt, Albany, Campbell, Carbon, Converse, Crook, Natrona, Niobrara, Platte, and Weston. This proposal would allow the aerial application of the herbicides Plateau and Journey to treat infestations of cheatgrass acres on the Medicine Bow-Routt National Forest and TBNG. Conjectured project implementation date June 2015.
Inyan Kara Analysis Area Vegetation Management, Phase II	T41-48N, R61-67W. Implement vegetation management to meet the desired goals of the Grassland Plan. Implementation was in the Fall of 2008.

Project Title	Project Description
Inyan Kara Assembled Land Exchange	This land exchange is being handles by the Inyan Kara Grazing Association on behalf of 13 landowners in Weston County, Wyoming. The land exchange consists of 16,600 acres. Proposed implementation date 2014.
Inyan Kara Riders Motorcycle Enduro Permit	The Inyan Kara Enduro operates under a Recreation Event five-year permit, in the Inyan Kara area of the TBNG. The existing permit expires 12/31/2010; this action is to renew the permit for another five-year term Implementation date 2011.
Irwin Land Exchange	2,720 acres of non-federal to federal and 2,400 of federal to non-federal. Optional acres of federal to non-federal taking into account issues with DM&E easements 1,360 acres. Project on hold.
Lance Oil Antelope FED 4171-10-21 - Road Use and Access Permit #41419	Lance Oil and Gas Company is proposing to use the NFSR 1121.E1 road for approximately 0.52 miles from the intersection of Antelope Road Campbell County RD 17-4 to the south in Section 3 T. 41 N., R. 71 W. on the TBNG. Implementation date August 2013.
Love Sol Project (range improvement)	T44N, R68W, Section 11. This project allowed for: drilling a water well and placing a watering trough on National Forest land. Two-hundred and twenty feet of ground was trenched for the pipeline. Solar panels disturbed approximately 100 ft2. Drilling of the well disturbed 7,000 ft2. Implementation was in Summer 2006, ongoing use of range improvements.
Mackey Road Geotechnical Soil/sediment Sampling # 37505	Peabody Powder River Mining, LLC (PPRM) will conduct geotechnical boring on National Forest System lands to explore subsurface soil and sediment properties. Implementation Winter 2011.
Martins Pipeline and storage tank (range improvement)	NE ¼, SE ¼, Section 15, T47N, R65W. Martins Pipeline and storage tank included: installation of 485' of underground water pipeline and one 8' diameter water tank. Implementation was in Winter 2006; ongoing use of range improvements.
Mary's Draw 2D Seismic Project # 35356	The Forest Service proposes to authorize geophysical surveys on the TBNG. The Mary's Draw 2D swath seismic project would utilize vibroseis as the energy source to provide data on potential minerals. Implementation Spring 2010.
NARM Dewatering Activity – Amendment to SUP DGL314	North Antelope Rochelle Mine (NARM) of Peabody Powder River Mining, LLC has requested an amendment to their current SUP DGL314 for Ancillary Facilities Related to Mining Activity to authorize drilling test holes for potential dewatering activity on National Forest System lands. The proposal consists of approximately 230 test holes on National Forest System lands totaling approximately 567 acres that occur outside the NARM lease boundary but within the mine's permit boundary. Implementation Summer 2012.
NARM Power Line Access Roads – Amendment to SUP DGL314	Peabody Powder River Mining, LLC, operator of North Antelope Rochelle Mine (NARM), has requested an amendment to their current SUP DGL314 for Ancillary Facilities Related to Mining Activity to authorize construction of three light-duty road segments on National Forest System lands. The proposal consists of approximately 1.2 miles of gravel roads (three separate segments) on National Forest System lands totaling approximately 2.9 acres that occur outside the NARM lease boundary but within the mine's permit boundary. Implementation date Winter 2013.
North Antelope Rochelle Mine Road Relocation	T 42 N, R 71 W, Section 23, 26, 27 and 34. The project proposes to construct new roads to relocate the existing Antelope and Matheson roads. The existing roads will be mined through, and there is a need to reroute the current travel way. Approximately 4.4 miles of road will be located on National Forest Service land. The current proposal is to grant a ROW to Campbell County. The construction corridor is 150 feet. Implementation was completed in 2010.

Project Title	Project Description
North Antelope-Rochelle Mine: Mackey Road Relocation	The Forest Service proposes to authorize Peabody Powder River Mining, LLC (PPRM), operator of North Antelope-Rochelle Mine (NARM), to vacate and relocate portions of CR 69 Mackey (large segment) and temporary CR83 Reno (small segment) County Roads on National Forest System land. Implementation September 2014.
North Antelope Rochelle and School Creek Mines 69 kV Power line	T42N, R71W, Sections 23, 25, 26, 27, 34 and 35 (approximately 20 miles south and east of Wright, Wyoming, Campbell County, within North Antelope Rochelle and School Creek Mine Permit areas). New construction of 69 kV power line will include approximately 19.5 total miles of 69 kV overhead power line. Approximately 14.9 miles will include Forest Service land, in order to move power lines out of existing coal mine leases.
Pacificorp DGL344	This is a re-issuance of a permit. It is for the operation and maintenance of an electric power line known as the Dave Johnston-Yellowcake-Antelope 230 kV line. Implementation date Summer 2012.
Plan Amendment for Prairie Dog Management	T37-48N, R62-73W, and T53-55N, R68-71W. The ferret reintroduction area boundary would be modified. This project would add management tools for controlling the prairie dog that are not currently available, such as lethal and non-lethal, landownership adjustment and third party solutions. Proposal to amend existing amendment with conjectured implementation of November 2015.
PreCorp Coleman Oil and Gas Power line, WO#50697	T41N, R72W, Section 15. A permit was issued to allow installation of 2,243 feet of underground 14.4/24.9KV 3 phase electrical line. The line was buried 48”deep in a 6” wide trench. The line was placed within 50’ of an existing buried power line. The ROW is 15’ on each side. Additional disturbance includes a 2.5 x 3’ area for a transformer/meter pedestal. Approximately 1.5 acres are impacted by this project. Implementation was in 2007.
PRECorp Nicholson CBNG SUP	T43N, R71W, Sections 18 and 19. This project included a meter drop and installation of underground electric and gas lines. Approximately 1 acre of National Forest Service land was disturbed.
PRECorp, Section 9	T41N, R67W, Section 9. Implementation was in Fall 2006.
PreCorp Special Use permit for Ballard Wildhorse Federal #14 – 18 Power line	This project allows the installation of <2 miles of <33 kV line to the Wildhorse Federal wells 14 and 18. The proposed route would utilize the existing road corridor. Implementation was in late 2011.
PRECorp Westport Meter Drop	Minerals, contact Amy Ormseth. T43N, R71W, Section 19. This project is a 3 phase power distribution line for a meter drop to several production areas. Implementation was in Spring 2007.
Rankin Brown Project (range improvement)	T47N, R65W, Sections 4, 5, and 8-10. This project allowed for 5.5 miles of PVC (12’ wide X 2”) pipe to be placed underground and for installation of 7 water troughs (8’x 2’). The pipes were installed with D8’s. Approximately 8.4 acres of National Forest land was disturbed. Implementation was in Fall 2007; ongoing use of range improvements.
RT Communications Permit Amendment for BNSF Line	Construction and maintenance of an additional 1250 feet of phone line to BNSF building for year round services. Implementation September 2014.
RT Communications, Inc. Keeline to Wright	T43N, R71W (Highways 450, 59, and 387). New fiber optic line would be placed in the ROW of Wyoming Highway 450, 90, and 387. This would be on 4.13 miles of National grassland. Implementation date is Winter 2013.
RT Communications, Inc. – South Upton Project	T47N, R66W (south Upton area). Replacing a new telecommunications line within and adjacent to a ROW. This area includes 6.69 miles (by 20’ wide) on National Grassland. Implementation date was May 2010.

Project Title	Project Description
Samson Resources Geophysical Exploration	Samson Resources has proposed to conduct an exploratory, 3D geophysical survey. The project are includes 240 square miles. The data generated from this survey will significantly enhance evaluation of the potential mineral resources. Implementation Winter 2011.
Samson Power line	Install 34.5kV, 3 phase single overhead power line across approximately 2621 feet within a 30 foot ROW Conjectured implementation April 2015.
Samson and Finley Road Reconstruction off Jenney Trail	Upgrade approximately 470 feet of road off of Jenney Trail. Conjectured implementation of March 2015.
School Creek Mine Coal Mining Startup Facilities	West Roundup Resources, Inc. (WRR) has requested an authorization to amend the existing School Creek Mine SUP to include an additional (approximately) 663 acres of National Forest Service land. Implementation was August 2012.
Thunder Basin Coal Company, LLC – Black Thunder Mine: Installation/Construction of Dewatering Wells and Overstripping Area	The proposed dewatering wells are located on National Forest System lands, and consist of two areas. The Forest Service has identified a need to authorize Thunder Basin Coal Company, LLC to construct the dewatering wells and overstrip activities. Implementation was August 2012.
Thunder Basin Coal Co LLC: Clinker Mining Expansion	T 43 N, R 70 W, Section 26. The existing permitted clinker mining area encompasses approximately 600 acres of National Forest Service land. The requested expansion comprises 40 acres, which would result in a total of approximately 640 impacted acres. Implementation was November 2012.
TBNG Fuels and Habitat Burn	T41N, R68W, Sections 21, 22, 26, 27, and 28. The Cow Camp burn comprises 1530 acres to encourage healthy fuel loads and appropriate wildlife habitat. Implementation was in Spring 2009.
Thunder Basin Pipeline, LLC DGL348	Thunder Basin Pipeline, LLC would like to operate and maintain an existing pipeline. The pipeline is associated with a small refinery north of Douglas, Wyoming. The pipeline is in a 30-foot ROW, 15 feet on each side of center line. A 6 inch crude oil pipeline and an 8 inch gas pipeline are in the ROW. It covers 8.13 acres or 2.235 miles of National Grassland. Conjectured implementation was July 2012.
Tidelands Geophysical – Coal Draw 3D Seismic Survey	Tidelands Geophysical Company (Tidelands) has submitted a Notice of Intent and Plan of Action (POA) to conduct geophysical exploration operations for the Coal Draw 3D Seismic Survey project on behalf of Seitel, Inc. The proposed project will encompass 3,426.85 acres of land managed by the Forest Service on the TBNG in Townships 40-42 North, Range 72-73 West. Conjectured implementation was December 2012.
Travel Management	Travel Management for the TBNGs. This project covers the entire Grassland. Review and analysis of the roads/trails for designation, include: opening trails/roads, closing trails/roads, converting roads to trails, decommissioning trails/roads, seasonal closures for trails/roads, and constructing trails/roads.
Upton Airport Permit Renewal DGL320	The Town of Upton is requesting to renew the SUP for the airport. This permit was first issued in 1955. The permit will cover 80 acres for operating and maintaining a public airport. Implementation date was July 2012.
Upton Mineral Material Development	The Forest Service proposes to develop two mineral material pit sites on National Forest Service land in the Upton area. The proposed pit developments will each be less than 5-acres in extent.

Project Title	Project Description
Upton-Osage Fuels Reduction Project	T48N, R65W, Sections 10, 13, 14, 15, also with Osage T46N, R63W, Section 3, 4, also with Clay Spur T47N, R63W, Sections 17, 18, 19, 20. 85 acres of sanitation salvage (overtopped, dead and dying trees), 256 acres of shelterwood (overstory and understory removal), Commercial Thinning 204 acres (remove pole size), 104 acres of Pre-commercial thin (smaller than pole size), understory removal, thinning from below, 75 acres of boundary treatment (trees 50-100 feet from the boundary), 195 acres of broadcast burning (understory burn to reduce timber treatment slash) is complete. Implementation was in Fall 2009.
Upton-Osage Timber Edge (range improvement)	T47N, R64W, Section 3. Place a 16' cylindrical, 20' tall tank over an existing pipeline. Disturbance area covers 100 square feet. Implementation was in Summer 2006.
Wellstar Corporation Natural Gasline	T43N, R69W, Sections 24-26. This project includes installing a gas pipeline in the existing corridor. This disturbed approximately 2.57 acres of national Forest Service land. Implementation was in Fall 2007.
Western Gas resources gas pipeline	T42N, R70W, Section 25, 29, 30. 850' long for a 6" pipeline. Implementation Fall 2007, ongoing.
Weston County Easements	This project would authorize the conversion of a number of existing crown and ditch roads that cross the TBNG to county ownership (T 41 N, R 67 W; T 43-47 N, R 63-67 W). This project was completed July 2012.
Weston Store	The Bethea's have proposed to build a convenience store at Weston, Wyoming (NE ¼, NE ¼, Section 25). This is the most convenient location for a store as it is accessible to Highway 59 and Heald County Road. The store would cover approximately 5 acres of Nation al Grassland. Project cancelled.
Westport Oil and Gas, Nicholson CBNG POD	T43N, R72W, Section 14. The plan of development (POD) included creating 10 CBNG wells. Approximately 760 acres of National Forest Service land was disturbed. Implementation date 2006.
Williams West Cripple Creek Coal Bed Natural Gas (CBNG) Plan of Development (POD)	T42N, R72W, Sections 14, 15, 22, 23, and 27 (Matheson Road). This project includes development of 14 CBNG well pads, two header buildings, and utility corridors. Total National Forest Service land disturbance was 39 acres, with an operating disturbance of 3.31 acres. Road use includes construction of 0.31 acres and use of existing roads. Project cancelled.
Wright Area Coal Lease by Application (LBA)	East of Wright, Wyoming. This project will analyze the applications for coal leases in the Wright area. It is aimed at the continuation of coal mining for the Jacobs Ranch, Black Thunder, and North Antelope Rochelle Mines. Implementation date is 2012 except West Highlight tract expected implementation date summer 2015.
Wyoming DOT Highway 59 Special Use Permit and Mineral Materials Contract # 35932	The Forest Service is proposing to authorize Thunder Basin Coal Company to acquire an adequate supply of aggregate construction material to support required maintenance and changes in infrastructure necessary for mining activities. Implementation July 2013.
Wyoming Pipeline Company – Mush Creek Pumping Station	Construction and maintenance of an additional 361 feet of natural gas line to Mush Creek pumping station tapping into existing line along Hwy 450. Conjectured implementation April 2015.
Wyoming Pipeline Company Butte Junction Crude Oil Pipeline Replacement	Replacement of 3.2 miles of existing crude oil pipeline with an additional 10 foot ROW for construction activities. Conjectured implementation July 2015.

4.22.3 Planning Area Cumulative Impacts by Resource

Air Quality

Casper Field Office

BLM and non-BLM actions are anticipated to increase emissions in the planning area over the life of the plan. For the planning area, the cumulative air quality impacts (as measured against national and state ambient air quality standards) are anticipated to be roughly the same on BLM and non-BLM-managed lands because it is assumed that the density of activities would be the same in both areas. This conclusion also assumes that nearby operations on both BLM and non-BLM-managed lands would not combine to result in greater impacts on a local scale. Potential impacts on PSD increments, visibility, and atmospheric deposition in distant Class I NWAs could be substantial.

Under all alternatives, cumulative emissions within the planning area are not anticipated to result in air quality impacts that exceed national or state ambient air quality standards because the emission sources likely would be widely separated. Impacts on air quality would be greatest under Alternative A, as development activity levels are anticipated to be greater than all other alternatives. The cumulative air quality would be improved under Alternatives B, C, and D. The greatest reduction in criteria pollutant emissions occurs under Alternative C and the least reduction in emissions would occur under Alternative D. Carbon dioxide equivalent emissions would also be less under all alternatives compared to those discussed under Alternative A with those discussed under Alternative C having the greatest reduction in emissions.

Kemmerer Field Office

BLM and non-BLM actions are anticipated to increase emissions in the planning area over the life of the plan. For the planning area, the cumulative air quality impacts (as measured against national and state ambient air quality standards) are anticipated to be roughly the same on BLM and non-BLM-managed lands because it is assumed that the density of activities would be the same in both areas. This conclusion also assumes that nearby operations on both BLM and non-BLM-managed lands would not combine to result in greater impacts on a local scale. Plumes from trona processing plants located on private lands are currently visible on BLM-managed lands, especially during winter air inversions, and would be expected to continue to be visible in the future.

Under all alternatives, cumulative emissions within the planning area would not be anticipated to result in air quality impacts that exceed national or state ambient air quality standards because the emission sources likely would be widely separated. It should be recognized, however, that short-term exceedances of the federal ozone standard have occurred in Sublette County in the northeast portion of the planning area; although the area has not been designated a nonattainment area. Under all alternatives, emissions increases would be spread over relatively large distances and are not expected to cause adverse impacts to AQRVs in nearby sensitive Class I air quality areas. Impacts on air quality would be greatest under Alternative A, as development activity levels would be anticipated to be greater than those discussed under the other alternatives. The cumulative air quality would be improved under Alternatives B, C, and D, with Alternative C providing the greatest degree of improvement.

Newcastle Field Office

BLM and non-BLM actions are anticipated to increase emissions in the planning area over the life of the plan. Under Alternative A, cumulative emissions within the planning area would result in air quality impacts that exceed national or state ambient air quality standards. The emissions from the new oil wells would cause the increased emissions which would contribute to the exceedance of federal and state standards. The greatest reduction in emissions would occur from management actions discussed under Alternative C and the least emissions reduction would occur under Alternative D and the Proposed LUP Amendments. Carbon

dioxide equivalent emissions would also be less under all alternatives compared to those discussed under Alternative A, with Alternative C showing the greatest reduction in emissions.

Pinedale Field Office

BLM and non-BLM actions are anticipated to increase emissions in the planning area over the life of the plan. The air quality analysis presented in the Pinedale Supplemental Environmental Impact Statement (SEIS) (BLM 2008) predicts potential visibility impacts to nearby sensitive Class I areas; impacts for other AQRVs were not predicted in nearby sensitive air quality Class I areas. It should be recognized, however, that recent short-term exceedances of the federal ozone standard have occurred in Sublette County within the Pinedale Field Office; although the area has not been designated a nonattainment area. Under Alternative A, cumulative emissions within the planning area would result in air quality impacts that exceed national or state ambient air quality standards because the emission sources. Under Alternative A, cumulative emissions within the planning area would result in air quality impacts that exceed national or state ambient air quality standards because the emission sources. The emissions from the new oil wells could cause the increased emissions which would contribute to the exceedance of federal and state standards. The greatest reduction in emissions would occur under Alternative C and the least emissions reduction would occur under Alternative D and the Proposed LUP Amendments. Carbon dioxide equivalent emissions would also be less under all alternatives when compared to those discussed under Alternative A, with Alternative C showing the greatest reduction in emissions.

Rawlins Field Office

BLM and non-BLM actions are anticipated to increase emissions in the planning area over the life of the plan. Under Alternative A, cumulative emissions within the planning area would result in air quality impacts that exceed national or state ambient air quality standards because the emission sources. The emissions from the new oil wells could cause the increased emissions which would contribute to the standards exceedances. The air quality analyses presented in project-specific EISs for the Rawlins Field Office predicted potential visibility and atmospheric deposition impacts to nearby sensitive Class I areas. The greatest reduction in emissions would occur under Alternative C and the least emissions reduction would occur under Alternative D and the Proposed LUP Amendments. Carbon dioxide equivalent emissions would also be less under all alternatives when compared to those discussed under Alternative A, with Alternative C showing the greatest reduction in emissions.

Rock Springs Field Office

BLM and non-BLM actions are anticipated to increase emissions in the planning area over the life of the plan. Under Alternative A, cumulative emissions within the planning area would result in air quality impacts that exceed national or state ambient air quality standards because the emission sources. Under Alternative A, impacts to AQRV from proposed activities within the planning area could be significant. The emissions from the new oil wells could cause the increased emissions which would contribute to the standards exceedances. The greatest reduction in emissions would occur under Alternative C and the least emissions reduction would occur under Alternative D and the Proposed LUP Amendments. Carbon dioxide equivalent emissions would also be less under all alternatives when compared to those discussed under Alternative A, with Alternative C showing the greatest reduction in emissions.

Bridger-Teton National Forest Planning Unit

Forest Service and non-Forest Service actions are anticipated to increase emissions in the planning area over the life of the plan. Under Alternative A, cumulative emissions within the planning area could result in increases of all air pollutants within the BTNF Planning Unit. The most significant increase would be from NO_x. It is likely that the increased emissions would contribute to an exceedance of a national or state ambient air quality standard. Also impacts to AQRV could be significant. The greatest reduction in

emissions would occur under Alternative C and the least emissions reduction would occur under Alternative D and the Proposed LUP Amendments. Carbon dioxide equivalent emissions would also be less under all alternatives when compared to those discussed under Alternative A, with Alternative C showing the greatest reduction in emissions.

Thunder Basin National Grassland Planning Unit

Forest Service and non-Forest Service actions are anticipated to increase emissions in the planning area over the life of the plan. For the planning area, the cumulative air quality impacts (as measured against national and state ambient air quality standards) are anticipated to be roughly the same on Forest Service and non-Forest Service-managed lands because it is assumed that the density of activities would be the same in both areas. This conclusion also assumes that nearby operations on both Forest Service and non-Forest Service-managed lands would not combine to result in greater impacts on a local scale.

Under all alternatives, cumulative emissions within the planning area are not anticipated to result in air quality impacts that exceed national or state ambient air quality standards because the emission sources likely would be widely separated. Impacts on air quality would be greatest under Alternative A, as development activity levels are anticipated to be greater than all other alternatives. The cumulative air quality would be improved under Alternatives B, C, and D and the Proposed LUP Amendments. The greatest reduction in criteria pollutant emissions would occur under Alternative C and least emissions reductions would occur under Alternative D. Carbon dioxide equivalent emissions are also less under all alternatives with Alternative C having the greatest reduction in emissions.

Medicine Bow National Forest Planning Unit

Under all alternatives, cumulative emissions within the planning area are not anticipated to result in air quality impacts that exceed national or state ambient air quality standards since no new wells are projected to be installed under any alternative. Any impacts to air quality would be from wind energy development, vegetation treatments, OHV activities, and other surface disturbing activities. Anticipated emissions from these other impacts are largely unknown within this planning unit. Any impacts on air quality would be greatest under Alternative A, as any development activity levels would be anticipated to be greater than all other alternatives. The cumulative air quality could be improved under Alternatives B, C, and D and the Proposed LUP Amendments. The greatest reduction in criteria pollutant emissions could occur under Alternative C and the least emissions reductions could occur under Alternative D. Carbon dioxide equivalent emissions are also less under all alternatives with Alternative C having the greatest reduction in emissions.

Cultural Resources

The cultural resource CIAA consists of the public lands within the planning area and the adjacent lands where the setting of historic properties within the planning area extends outside of the public lands. This CIAA was identified because BLM and Forest Service are not only required to manage the physical remains of historic properties, but also the setting where it is an important aspect of integrity of the property

The cumulative impact of development activities from BLM, Forest Service and non-BLM/Forest Service actions within the planning area is anticipated to adversely impact the context and historical setting of some cultural resources, including some NHTs. No quantitative data are available for assessing cumulative impacts to the historical setting of cultural resources. Moreover, plan alternatives are not anticipated to result in measurable differences in impacts to historical settings from non-BLM/Forest Service actions.

Current and future trends in the CIAA include population growth, urban encroachment, increases in mining, fluid mineral leasing, leasable minerals, renewable energy development, ongoing grazing, increase in recreational demand, road construction, water diversions, invasive species, erosion, wildland fire, forest

disease and insects, drought, and climate change. Trends would continue to affect cultural resources and cultural landscapes through loss or disturbance of resources that are not or cannot be protected, changes in setting, pressure from incremental use, loss of access for Native Americans to resources, and theft or vandalism of cultural resources.

Although cultural resources on public land are provided legal protection, similar protection does not apply to cultural resources from private actions on private lands. Likewise, limited restrictions on public lands exist to protect the historical setting of cultural resources on public lands. Due to the mixture of public and private land ownership adjacent throughout the planning area, cumulative impacts to specific cultural sites and the historical settings are not regulated and are expected to continue. As a result, when added to the impacts identified above, Alternative C will have the least degree of cumulative impacts on cultural resources on public lands due to its restrictions. However, because of the restrictions on public lands, there is an increased potential for development on private lands without protective stipulations to mitigate impacts to cultural resources and their settings. With increased development comes the potential to lose increasing amounts of scientific information derived from cultural resources, resulting in a cumulative net loss of historical context. This might lead to a diminished capacity to understand and evaluate issues of national heritage. The anticipated impact due to Alternative D is more than Alternatives B and C and less than Alternative A and the Proposed LUP Amendments. However, because it allows for some development on public lands, there will likely be less shifting of such development to private lands that have fewer requirements to protect cultural resources. As such, Alternative D is likely to result in the fewest cumulative impacts to cultural resources.

Forestry

The CIAA used to analyze cumulative impacts on forestry includes the entire planning area.

Cumulative impacts on forestry would occur as a result of the increased surface disturbances from development, recreation activities, and fire management occurring within the planning area. As general use, recreation, mineral development, and fuel loads increase as a whole throughout the planning area, potential for impacts to forestry from fire, habitat loss, forestry conversion, and loss of access. Cumulative impacts on forestry would likely occur under all alternatives but they would be the least under Alternative C as surface disturbing activities would be more restricted than those listed under other alternatives. Having the most restrictions from surface disturbing activities could reduce access to forestry products and limit timber production. Impacts on forestry products would be the highest from surface disturbing activities listed under Alternative A but management actions would be the least restrictive on access to forestry products and timber production which could increase production.

Lands and Realty

The Gateway South, Gateway West and TransWest Express transmission projects are not subject to/exempt from the Proposed LUP Amendments decision to designate PHMA as an avoidance area as detailed in management actions 10, 32, and 127.

The Obama Administration identified these transmission projects as priority projects, as part of the President's commitment to job creation and modernizing America's Infrastructure. These transmission projects were three of seven projects identified for expedited permit review and federal agency coordination among an interagency Rapid Response Team for Transmission (RRTT) established to foster coordination, expedite simultaneous permitting processes and resolve permitting challenges, while ensuring appropriate environmental reviews.

The BLM is currently processing the applications for Gateway South, Gateway West, and TransWest Express, a high-voltage transmission line, which includes alternatives through this avoidance area/Greater

Sage-Grouse habitat. The BLM is analyzing conservation measures for Greater Sage-Grouse as part of the review process for Gateway South, Gateway West, and TransWest Express.

The CIAA used to analyze cumulative impacts on the uses administered by the lands and realty program includes the entire planning area. Cumulative impacts on lands and realty management would result from actions that create constraints and/or opportunities for ROW authorizations (e.g., pipelines, power lines, transmission lines, roads, and communication sites) and land tenure adjustments. Increased development within and outside of the CIAA has increased the demand for land tenure adjustments and additional ROWs for pipelines, transmission lines, and other facilities that support development. Placing restrictions on ROWs affects the ability to address such demand, reduces ROW routing options, and has the potential to increase project costs.

Cumulative impacts on lands and realty management are primarily the result of implementing surface use restrictions and management prescriptions designed to protect sage-grouse habitat, other habitats, and sensitive resources (e.g., big game and Special Status Species' habitat, cultural resources, important viewsheds, special designations). Implementing these actions would limit or restrict ROW project design and where ROWs would be permitted. The greatest impacts would occur in areas where surface disturbing activities are prohibited or in ROW exclusion areas, as this would require proposed ROWs to be relocated outside of these restricted areas. Relocation of ROW facilities could also occur within areas where surface disturbing activities are restricted or in ROW avoidance areas. If avoidance of these areas is not possible, other mitigation measures could be required, such as application of height and other specifications that serve to redesign ROWs to mitigate impacts on sage-grouse habitat and other sensitive resources. Land use restrictions that result in the relocation or redesign of proposed ROWs would increase management efforts and costs related to proposals submitted by ROW applicants.

The actions and activities considered in this analysis, including land use restrictions for the preservation of sensitive resources, would not prevent the BLM or Forest Service from accommodating major utility and transportation corridors, but rather require ROW applicants to design and locate proposed ROW facilities in a manner that minimizes related effects on other resources. Cumulative impacts would be the least intensive under Alternative A because of fewer land use restrictions for the protection of sensitive resources. Conversely, the implementation of increased restrictions to protect sensitive resources under Alternative C would result in the greatest level of impact on lands and realty management.

Livestock Grazing

The CIAA used to analyze cumulative impacts on livestock grazing includes all allotments that either entirely or partially overlap the planning area. Livestock are managed within the boundaries of these allotments, and therefore could be affected by activities occurring in these areas. Past actions that have affected livestock grazing include human-caused surface disturbances (mineral development, recreation, prescribed burning, and mechanical vegetation treatments) and wildland fires that have contributed to current ecological conditions.

Potential cumulative impacts on livestock grazing within the planning area would result from a combination of activities and land uses occurring within the area. Such impacts would result primarily from surface-disturbing activities. Surface disturbing activities, including oil and gas and mineral development activities and related construction of roads, pipelines, and well pads, would lead to a cumulative increase in soil disturbance, vegetation removal, noxious and invasive weed proliferation, and loss of available forage for grazing. Impacts would be greater in areas with high-density oil and gas and mineral development projects. Restrictions and prohibitions on newly permitted surface disturbing activities, as well as reclamation efforts and vegetation treatments would reduce impacts on livestock grazing. A reduction in development and recreation activities would decrease soil disturbances and vegetation removal, and increase available forage.

The implementation of BLM's mitigation guidelines, reclamation requirements, rangeland guidelines, vegetation treatments, and monitoring efforts would also provide protection to forage resources on federal lands, which would help reduce overall effects on livestock grazing resources.

Present actions affecting livestock grazing are mainly those that reduce available grazing acreage, restrict management actions or the level of forage production in those areas. Key examples include wildland fires, motorized vehicle use, habitat restoration, fuels reduction, and special designations that restrict grazing. Cumulative impacts would be greatest under Alternative A because of fewer restrictions on newly permitted surface disturbing activities and mineral activities in sage-grouse priority habitat areas. Under Alternative C, increased restrictions on newly permitted surface disturbing activities, recreation, and mineral activities would reduce the potential for surface disturbance and vegetation removal, and loss of available forage for livestock grazing. Cumulative impacts under Alternatives B and D and the Proposed LUP Amendments would be greater than under Alternative C because of fewer restrictions on newly permitted surface disturbing activities, recreation, and mineral activities in sage-grouse priority habitat areas.

Mineral Resources

The CIAA used to analyze cumulative impacts on minerals management and wind energy development includes the entire planning area. Management activities occurring within the planning area are not expected to affect mineral resource and wind energy development management outside of the planning area. Past, present and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely to continue to affect minerals are market forces, availability of resources for development, regulatory and prescriptive constraints, and reservoir/reserve depletion.

Cumulative impacts on mineral development from these LUP amendments would occur from restrictions that prohibit or restrict surface disturbance that ultimately decrease the number of oil and gas wells drilled during the planning period, as well as the acres of land open to solid mineral leasing and mineral material disposal and to location of mining claims, the latter limiting areas where 3,809 surface management operations could be conducted. Prohibiting surface disturbance would not allow for the construction of some well pads, access roads, pipelines, and ancillary facilities. Offsite methods such as directional drilling would be required to access oil and gas resources. In some cases, an operator could place a well pad, access road, or production facility in a less-sensitive area and drill to the well directionally to recover reserves underlying the area prohibited from surface disturbing activities. The equipment and personnel required for directional drilling could increase the complexity of operations and slow the drilling process. Directional drilling increases the risk of drilling problems such as stuck casing and diminished well production. Prohibiting surface disturbance and applying extra lease stipulations and terms could also cause an operator to move to nearby private or state land with no such restrictions and drill wells that could lead to drainage of federal reserves and loss of federal revenue. However, the indirect and cumulative effects of consolidating infrastructure over the life of multiple oil and gas reserves could reduce the need for ancillary infrastructure over the larger region as infrastructure becomes more centralized, and less infrastructure would be necessary to deliver products downstream.

Restricting surface disturbance could lead to the relocation of well pads, access roads, pipelines, and ancillary facilities to areas with fewer restrictions. Relocation of these proposed facilities could cause temporary delays in developing oil and gas resources and other minerals and could limit mineral development activities in these areas.

Oil and gas and other mineral development are expected to continue under all alternatives. Alternative A would have the greatest amount of wells during the planning period. Alternative C would have the least because of surface disturbance and density restrictions for the protection of sage-grouse habitat.

Solid mineral operations (e.g., coal and non-coal) would continue under all alternatives on existing leases. However, new development would be restricted from an increase in lands identified as unsuitable for coal leasing and closed to non-coal leasing and development. Alternative A would allow for the most development of coal and non-coal resources.

Similarly, prohibiting surface disturbing activities would limit the development of wind energy sites. Wind development could cause a project proponent to move to nearby private or state land with no such restrictions. Restricting surface disturbing activities could lead to the relocation of wind energy development sites. These measures could cause temporary delays in developing wind energy. If suitable adjacent sites are not available, wind energy development could be prohibited. Wind development is expected to continue under all alternatives. Alternative A would have the greatest number of turbines installed during the planning period with the most location options. Alternatives B and C, and the Proposed LUP Amendments project 90% fewer wind turbines than Alternative A will be developed during the planning period due to restrictions for the protection of sage-grouse habitat.

Paleontology

The paleontology resource CIAA consists of the entire planning area because each paleontological resource is limited to a specific area and would not likely be influenced by activities occurring outside the planning area.

Current and future trends include population growth, urbanization, mining, fluid mineral leasing, renewable energy development, increase in recreational demand, road construction, and erosion. For actions on public land and the mineral estate managed by the BLM, impacts would be minimized through existing laws, regulations, and stipulations addressing surface-disturbing activities. Other ground-disturbing activities such as road construction, real estate development, and utility infrastructure in the CIAA may be reviewed by other federal, state, or local agencies for the presence and scientific value of paleontological resources and steps taken to recover or avoid significant finds. Actions on private land could result in the inadvertent destruction of paleontological resources or the removal of fossils without any scientific study. Population growth and increasing recreational demand can impact resources from unauthorized removal, vandalism, incremental damage of surface resources, and subsequent erosion.

Because of the legal protections afforded paleontological resources, there are no substantial differences in the potential for cumulative impacts among the management alternatives in relation to paleontological resources on public lands. Development activities occurring on private and state lands with no federal jurisdiction would have the greatest cumulative impact on paleontological resources within the planning area. A large portion of the minerals activities analyzed above would occur on private and state lands, especially within the checkerboard landownership areas. These surface disturbing activities result in the damage or loss of paleontological resources by removing or altering the context of these sites, thereby limiting the potential to extrapolate data. The lack of legal or regulatory protections for paleontological resources on non-federal lands means development in those areas is more likely to result in a loss of scientifically significant paleontological information. As a result, when added to the impacts identified above, Alternative B will have the least degree of cumulative impacts on paleontological resources on public lands due to its restrictions. However, because of the restrictions on public lands, there is an increased potential for development on private lands without protective stipulations to mitigate impacts to paleontological resources.

Recreation

The CIAA used to analyze cumulative impacts on recreation resources includes the planning area, all big game herd units that intersect the planning area, and recreational trails and road systems that connect to the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected, and will likely to continue to affect, recreation stem primarily from increased visitation to the area, mainly from nearby communities. Population increases and advances in outdoor recreation equipment and practices help to drive visitation increases. Motorized vehicles are more capable of accessing previously remote areas in Wyoming and many people who move to surrounding communities choose to live in the area because of the ease of access to outdoor recreation opportunities.

Several big game wildlife populations are managed within the CIAA and therefore could be impacted by activities occurring in these areas. Because hunting is a major recreation activity within the planning area, any activities that affect game populations would in turn impact recreation activities. Decisions in these LUP amendments are designed to limit or reduce impacts to Special Status Species wildlife habitat, especially for sage-grouse. Although there would be some related benefits to big game species, which would in turn benefit recreational hunting opportunities. The greater effect on recreation from this RMP would affect primitive and undeveloped recreational experiences through decreased visual intrusions, noise levels, and traffic volumes as a direct and indirect result of decisions aimed at protecting sage-grouse.

Seasonal restrictions designed to protect sensitive resources (e.g. sage-grouse) could reduce recreational opportunities for some users by limiting access to certain areas; however, such restrictions could also enhance the experience of other users who desire solitude and primitive recreation opportunities. Disturbance caps within core habitat areas would also enhance primitive and undeveloped recreational experiences. These cumulative effects would be greatest near core habitat areas and least near private lands, where such protection from development would not be extended.

Cumulative impacts on recreation would be greatest under Alternative A because development activities are anticipated to be greatest under this alternative. Impacts would be least intensive under Alternative C because of increased protections to wildlife and from prohibiting or limiting the amount of surface disturbance and disruption that would occur throughout the planning area.

Socioeconomics

The CIAA used to analyze cumulative impacts on socioeconomics includes the entire planning area. Cumulative impacts to socioeconomics would result from primarily from actions that affect resource uses, particularly mineral development and production, wind energy development and production, livestock grazing, and recreation. While these resource uses do affect, and are affected by, resource users and other developments outside the planning area, the cumulative impacts from these resource uses on public lands affected by this planning action would be primarily experienced within the planning area.

The social and economic impacts of these resource uses on BLM-administered lands and National Forest System lands take place in the context of social and economic impacts from these resource uses on other lands in the planning area, social and economic impacts driven by other activities in the planning area (e.g., public infrastructure development), and broader social and economic trends (e.g., in- and out-migration, changes in social values, trends in energy prices, etc.). Thus, the social and economic impacts from BLM and Forest Service decisions in this planning action are just a part of the many contributing factors to the social and economic changes taking place in the planning area.

With respect to mineral development and production, in some cases the management decisions may have impacts on oil and gas activity on non-federal mineral estate. The RFD indicates that some reductions in oil and gas activity on non-federal mineral estate in sage-grouse habitat areas will occur in Alternatives B and C, but not in the other alternatives. Conversely, some of the reductions in oil and gas activity on federal mineral estate may be made up in areas outside of sage-grouse habitat areas. The net effect is that net reductions in total oil and gas production across the planning area are likely to be larger under Alternatives

B and C than the other alternatives, with related economic losses to some local communities and the state. At the same time, net reductions in oil and gas activity that may occur under Alternatives B and C may reduce social impacts such as stresses on community resources and community cohesion that have been observed in areas with high levels of rapid oil and gas development, and that are probable in some parts of the planning area under any of the alternatives.

Very large reductions in the BLM-administered lands and National Forest System lands available for wind energy development and production would occur in Alternatives B and C, and the Proposed LUP Amendments relative to Alternatives A and D. In addition, Alternatives B and C have significant restrictions that would affect the routing or feasibility of the electricity transmission lines necessary for large-scale wind energy development in Wyoming. Some of the reductions in wind development may be made up on non-BLM lands and non-National Forest System lands, and transmission lines may still be possible, at increased cost. In general, impacts on the overall wind energy development industry in Wyoming would be most likely under Alternatives B and C, with related economic losses to some local communities and to the state.

Some changes to livestock grazing practices on BLM-administered lands and National Forest System lands would occur under any of the alternatives. In most cases, these changes can probably be accommodated or made up for on other lands in the planning area. However, Alternative C's prohibition on livestock grazing within priority habitat areas may result in losses of forage availability that cannot be made up for on other lands or through other approaches to livestock feed. This would exacerbate broader trends that are reducing the economic viability of livestock grazing, and potentially result in net economic losses to some local communities and the state, and social impacts in terms of a reduced role for livestock grazing customs and culture in the social fabric of some communities.

To the extent that management actions under the alternatives (mostly under Alternatives B and C) restrict certain recreational activities in sage-grouse habitat on BLM-administered lands and National Forest System lands, in many cases these activities would relocate to other lands. At the same time, recreation could increase on some BLM-administered lands and National Forest System lands because the protections of open space (particularly under alternatives B and C) would be attractive to some types of recreationists. The net effects to total recreational activity on all lands within the planning area, and to the economic activity and social impacts from recreation are likely to be small, particularly relative to the net effects that could occur in some of the alternatives from the other resource uses.

Soils

The CIAA used to analyze cumulative impacts on soils includes the entire planning area. Surface-disturbing activities occurring within the planning area are not expected to affect soil resources outside the planning area. However, watershed impacts (sediment delivery to stream systems, sedimentation, changes in frequency, duration, and volume runoff) could extend beyond the planning area.

Cumulative impacts on soils would result from all surface-disturbing activities and the associated erosion, and focus on removal of vegetation cover, soil compaction, and loss of productivity. Mineral development activities, including oil and gas, coal, and other minerals, and related construction of roads, pipelines, and well pads would be the primary cause of such disturbances, although activities such as utility corridor and wind energy development would also contribute cumulatively to localized impacts on soils. Vegetation treatments and large range improvements, including prescribed fire, likely have and would continue to impact soils resources locally, but they would increase vegetation cover, and thus soil health, over the long term. Similarly, all forms of recreational activities, but particularly OHV use can increase potential for erosion, sedimentation, gully creation, biologic soil crust damage, and riparian and upland vegetation

damage. However, the significance of such impacts varies with the nature and degree of disturbance as well as site specific environmental conditions.

The implementation of BLM's and Forest Service' mitigation guidelines, prohibitions and/or restrictions on surface use, continued implementation of healthy rangeland standards, and monitoring efforts would provide protection to soils on federal lands and lands with federal subsurface minerals, which would help reduce cumulative effects.

Combined with the proposed management actions, cumulative impacts to soils would be greatest under Alternative A because of fewer restrictions on newly permitted surface disturbing activities in sage-grouse core habitat areas. Under Alternative C, increased restrictions on newly permitted surface disturbing activities would reduce the potential for surface disturbance and vegetation removal and any subsequent increases in erosion, runoff, and loss of soil productivity, resulting in the least intensive impacts. Cumulative impacts under Alternative B and D and the Proposed LUP Amendments would be greater than under Alternative C because of fewer restrictions on newly permitted surface disturbing activities in sage-grouse core habitat areas.

Special Designations

The CIAA used to analyze cumulative impacts on SD/MAs includes the entire planning area. Because management associated with the SD/MAs are intended to protect the resource values and uses for which they have been identified, it is not anticipated that any additional activities outside of the planning area would have a cumulative impact on the SD/MAs.

Past, present and reasonably foreseeable future actions and conditions within the CIAA that have affected, and will likely to continue to affect, special designations are primarily surface-disturbing activities and protection of sensitive resources (e.g. sage-grouse).

Cumulative impacts on SD/MAs would primarily occur from surface disturbing activities associated with various forms of development and structures associated with development; including, but not limited to, power lines, wind turbines, generators, substations and other above-ground facilities. While some SD/MAs are managed specifically for surface disturbing activities, such as oil and gas and wind development, the majority of SD/MAs are managed to protect specific resource values and uses. Many of these resource values and uses would be directly or indirectly impacted by surface disturbing activities. Examples of SD/MAs resource values and uses that would be impacted by surface disturbance include cultural and paleontology, wildlife, vegetation, soils and watersheds, visual resources, and primitive and semi-primitive recreational opportunities. Increased levels of development and other surface disturbing activities could result in the loss or degradation of undiscovered cultural and paleontological resources. Modifications to the landscape caused by surface disturbance could impact vegetation communities and increase soil erosion and the overall integrity of the landscape which could also have a direct impact on wildlife habitat. Additionally, increased levels of surface disturbance and the associated increase use of heavy equipment, presence of humans, and increase noise levels could result in increased stress levels to wildlife and on their movement and migration patterns and natural habitat. Impacts to the integrity of the landscape caused from surface disturbance would result in the degradation of visual qualities and opportunities for primitive and semi-primitive recreational experiences.

Decisions in these LUP amendments are designed to limit or reduce impacts to Special Status Species wildlife habitat, especially for sage-grouse. Because this is largely accomplished by preventing surface-disturbance, many of the cumulative impacts described in the previous paragraph would be reduced by the actions in these LUP amendments, particularly under alternatives B and C.

Cumulative impacts on SD/MAs would be greatest under Alternative A because development activities are anticipated to be greatest under this alternative. Impacts would be the least intensive under Alternative C because of increased protections to sensitive resources and from prohibiting or limiting the amount of surface disturbance that would occur throughout the planning area.

Special Status Species

The CIAA used to analyze potential impacts on Special Status Species vary by species and the habitat they inhabit or use for migration (for wildlife) both inside and adjacent to the planning area. Cumulative effects on Special Status Species plants and animals within the CIAA would result primarily from surface-disturbing and other disruptive activities such as mineral development and associated infrastructure, wind energy development, fences of all kinds, ROW and road development, prescribed and wildland fire, introduction and spread of non-native, invasive plant species; urban expansion and subdivision of private lands, and dispersed recreation. These activities could result in short-term and long-term habitat loss, fragmentation, and animal displacement. Habitats could become unavailable to wildlife because of human disturbance factors (e.g., traffic, noise, energy development) during sensitive time periods such as winter, birthing, nesting, and early rearing of young. Loss of vegetation from development activities would degrade habitat and increase competition for food resources among special status and other wildlife species.

Oil and gas development would cause the greatest amount of surface disturbance through construction of well pads, roads, pipelines, and other facilities. Reclamation and mitigation efforts would reduce impacts on special status wildlife; however, construction and maintenance of roads and well pads and the presence of humans would result in long-term or permanent impacts. Special Status Species, under the ESA and Wyoming BLM and Forest Service sensitive species guidance, would be protected on federal lands by site-specific mitigation, including exclusion or avoidance of all surface-disturbing activities; however, protection of non-federally listed species on private and state lands may not occur, resulting in potentially significant impacts on these species. The degree of impact would depend on the timing of development activities and whether the amount of activity outpaces the successful reclamation and revegetation efforts in disturbed areas. Because of this pace of development (whether federal mineral, commercial, or private residence), more pressure would be put on habitats outside of the development (likely private lands) as wildlife is displaced from the disturbances.

Surface disturbance could increase the proliferation of noxious and invasive weeds, which could increase the need for weed-controlling activities. Vegetation treatments could cause short-term impacts on vegetation by decreasing vegetation production and increasing establishment of early successional species. Long-term effects could include increased production and diversity of vegetation communities. Untreated weeds on non-BLM lands or non-National Forest System lands that spread to adjacent BLM-administered lands or National Forest System lands would result in degradation of native habitat. Weed treatments on non-BLM lands or non-National Forest System lands which are intermingled with BLM-administered lands or National Forest System lands are the responsibility of the private landowner or lessee. Coordination with non-BLM or Forest Service landowners in the development and application of weed treatments would assure that weeds are identified and treated on all ownerships to maintain productivity of native vegetation, which comprises important wildlife habitats.

The degree of impact on vegetation communities (habitat for special status wildlife) would depend on the timing of activities and whether the amount of activity within the CIAA outpaces successful reclamation and revegetation efforts in disturbed areas. The implementation of BLM or Forest Service's mitigation guidelines, BMPs, and restrictions on surface use would help to reduce overall effects. However, given the level of anticipated mineral development and that most of the native shrub communities (e.g., sagebrush) require in excess of 20 years to reestablish to pre-disturbance conditions, surface disturbance impacts are

expected under all alternatives, with the greatest amount of impacts under Alternative A and the lowest impacts under Alternative C.

Special Status Species – Greater Sage-Grouse

Introduction

The past, present and reasonably foreseeable future actions within the CIAA would result primarily from surface-disturbing and other disruptive activities such as mineral development and associated infrastructure, wind energy development, livestock grazing, fences of all kinds, ROW and road development, prescribed and wildland fire, introduction and spread of non-native, invasive plant species; urban expansion and subdivision of private lands, and dispersed recreation.

The cumulative effects analysis study area extends beyond the planning area boundary and consists of WAFWA sage-grouse Management Zones (MZ) I, II and VII. This Draft EIS contains a quantitative cumulative effects analysis for Greater Sage-Grouse habitat within the planning area boundary. At the larger WAFWA MZ level, the analysis is primarily qualitative in nature.

WAFWA Management Zone I

Major threats to sage-grouse habitats and populations occurring across populations in this MZ include oil and gas development, infrastructure, and conversion of native rangeland to crops; however, habitat conversion is of greater concern outside of Wyoming within MZ 1 (USFWS 2013). Over 6.3 million acres (14%) of sage-grouse habitat is currently leased for the development of federal fluid minerals. Additionally, most sage-grouse habitats within the MZ have the potential to be influenced by coal mining and/or the development of geothermal energy, although coal and mineral developments currently directly influence <1% of the lands in the region. Regional assessments estimated that 7.2% of priority and general habitats in MZ I are directly influenced by agricultural development, and >99% of these habitats are within 6.9 km (4.3 mi) of agriculture; less than 1% of sage-grouse habitats are directly influenced by a natural gas or oil well, however nearly all (100%) lie within 19 km (11.8 mi) of a well - the estimated effects area (Johnson et al. 2011, Taylor et al. 2012).

BLM or Forest Service managed grazing allotments not meeting wildlife standards constitute 2% of MZ I and are not widespread throughout the region; however, most of the sage-grouse habitats in MZ I are privately owned and are not addressed in this analysis. Livestock grazing is consistently mentioned across populations in the region as being a potential threat to the persistence of sage-grouse (USFWS 2013). Fire risk is generally low across MZ I, with 17% of priority and general habitats having a high risk for fire; however, isolated areas, especially in central Montana, South Dakota, the border between Montana and Wyoming, and eastern Wyoming, are identified as having high fire risk. Risk of cheatgrass presence was not available for this region, but cheatgrass (and Japanese brome, *Bromus arvensis*) are known to occur in this region. Thus, risk of annual grass invasion, as well as annual-induced fire, appear to need better documentation across the region. To help prevent increasing cheatgrass dominance on these rangelands, potential for invasion can be assessed when planning habitat treatments and rehabilitating disturbed areas, with pre-disturbance abundance being a good indicator of potential for post-disturbance response (Davies et al. 2012). Urban development, power lines, vertical structures and railroads directly influence less than 1.7% of the sage-grouse habitats in the region; however, where these threats occur in MZ I, the distribution is relatively dense compared to western portions of the sage-grouse range.

This MZ spans four states: Wyoming, Montana, North Dakota and South Dakota, and continues into Canada (USFWS 2013). There are four Greater Sage-Grouse populations within MZ 1: the Dakotas, Northern Montana, Powder River Basin, and Yellowstone Watershed (USFWS 2013). The Greater Sage-Grouse leks within this MZ are one of the more highly connected networks of the MZs. It is estimated there is an 11%

chance that the population of Greater Sage-Grouse could fall below 200 males by 2037 and a 24% chance the population could fall below 200 males by 2107 (Garton et al. 2011).

Within MZ I, oil and gas leasing, other mineral development, livestock grazing, infrastructure projects such as roads, pipelines, and power lines are primary past, present, and reasonably foreseeable actions. The above activities, in conjunction with other less prevalent activities comprise the cumulative effects, the majority of which result in surface disturbance, removal of vegetation, and fragmentation of habitat. These effects are the major threats facing Greater Sage-Grouse. See Table 4-109 for projects throughout the planning area, and particularly Casper, Newcastle, Rawlins and TBNG for projects that are within or in proximity to MZ 1.

Energy Development and Infrastructure

The greatest cumulative effect to Greater Sage-Grouse habitat would result from surface-disturbing and other disruptive activities in the form of direct habitat loss or habitat fragmentation, and would likely cause long-term displacement of Greater Sage-Grouse through habitat loss and lek abandonment. The lack of undisturbed habitat in the region and throughout the MZ places additional stress on remaining habitat and the birds that rely on the habitat. Oil, gas, and CBNG leases, in addition to infrastructure associated with these activities that are currently in production or would be developed on valid, existing rights would add to the habitat loss and fragmentation anywhere sagebrush habitat occurs.

Seasonal restrictions on mineral development that are applied within a specified distance of leks during breeding and nesting time periods would be likely to slow rates of overall habitat loss, lek abandonment, and resulting population decline; however, these limitations would not prevent further habitat destruction from occurring. Within Alternative A, surface disturbance would be prohibited or restricted through lek buffers and seasonal restrictions, however, the Proposed LUP Amendments would prohibit surface disturbance over a much larger area compared to A and Alternative D only restricts surface disturbance. Alternatives B and C do not have quantifiable restrictions for surface but has management prohibiting overall density of disturbance which attempts to reduce habitat fragmentation and continued disturbance and loss of sage-grouse habitat. In addition, Alternative B closes all priority habitat to oil, gas, and CBNG leasing, and Alternative C closes all priority and general habitat to leasing.

Closing areas to oil, gas, and coalbed methane development, in addition to applying NSO and CSU restrictions to sage-grouse habitat could protect in-tact, undisturbed expanses of sagebrush for sage-grouse. Alternative A and the Proposed LUP Amendments provide approximately the same amount of closed acres, Alternative D provides slightly more acres, Alternatives B and C close the largest number of acres, with Alternative C providing the greatest area of closure to oil, gas, and coalbed methane development. Alternatives B and C have the largest areas of NSO, with the Proposed LUP Amendments having more than Alternative A; Alternative D does not contain any NSO management. Seasonal restrictions in the Proposed LUP Amendments protect the largest area compared to Alternative A, with D having the least. Alternatives B and C do not have management for NSO or CSU for oil, gas, and coalbed methane development. Overall, Alternative C protects the largest area of habitat from oil, gas, and coalbed methane development and Alternatives D and A protect the least.

Infrastructure is a major threat to Greater Sage-Grouse from habitat fragmentation and habitat loss. Roads, pipelines, and transmission lines create linear disturbance and usually don’t end at state lines, adding to cumulative impacts beyond the planning area. Alternative A maintains the existing exclusion and avoidance areas for ROWs and has lek buffers to prevent road and other development within proximity to Greater Sage-Grouse leks. Alternative B excludes Greater Sage-Grouse priority habitat and existing exclusion areas from ROW development and includes infrastructure in the DDCT calculations toward the 3% disturbance threshold. Alternative C provides the greatest protection to sage-grouse habitat by excluding both priority and general habitat from ROW development. Roads would be prohibited within four miles from leks in

both priority and general habitat. Alternative D would have ROW exclusion areas similar to Alternative B, but lek avoidance buffer for roads with distances similar to Alternative A. The Proposed LUP Amendments have the same ROW exclusion restrictions as Alternative A but greater lek buffer distances for disturbing activities and road development. Overall, Alternative C provides the most protection of habitat from linear disturbances and surface disturbance from infrastructure development. Alternative A could allow the most surface and linear disturbance within Greater Sage-Grouse core and general habitat.

Disease

West Nile virus is the main disease threat identified in the Wyoming Greater Sage-Grouse LUP Amendments. While sage-grouse are all equally susceptible to the disease; smaller, isolated populations are more vulnerable to extirpation by the disease than larger populations of sage-grouse (Taylor et al. 2012). In addition, populations in areas with increased surface water at lower elevations become even more at risk (Taylor et al. 2012). Reductions of man-made water sources could help reduce or prevent the spread of West Nile virus (Taylor et al. 2012). RDFs in Appendix B of this document describe the management that would be required to reduce or prevent the introduction and spread of West Nile virus. There is very little management variation between alternatives for disease in the Amendments.

Conversion to Agriculture

Within the Powder River Basin portion of MZ I, the threat from conversion to agriculture is not a major management concern and is not addressed in the LUP amendments. There is no management variation other than restriction to surface disturbing activities in proximity to leks that would apply to this threat.

Conclusion

Rangewide conservation of Greater Sage-Grouse and sage-grouse habitat has been initiated by federal, state, and local government agencies. The WAFWAs in cooperation with the Forest Service, BLM, USFWS, and USGS (U.S. Geological Survey) have published strategies to "maintain and enhance populations and distribution of sage-grouse by protecting and improving sagebrush habitats and ecosystems that sustain these populations." WAFWA, in coordination with the Western Governors' Association recommended passing the North American Sagebrush Ecosystem Conservation Act (NASECA). The NRCS launched the Sage-Grouse Initiative in 2010 to work with private landowners in sagebrush conservation. The Farm Service Agency began a program in 2010 to Conservation Reserve Program lands out of agriculture production and return the land to perennial vegetation. Within Wyoming, the Governor has issued an executive order for the Core Area Population Area Strategy (WGFD 2011). Other states bordering Wyoming have also taken steps to reduce the impacts to Greater Sage-Grouse habitat in those states.

Habitat conservation through regional efforts, threat reduction as identified in the Greater Sage-Grouse (*Centrocercus urophasianus*) Conservation Objectives Final Report (USFWS 2013), and management proposed in these amendments (including the Wyoming Core Area Strategy) could help prevent or reduce habitat fragmentation and habitat loss. Alternative C would provide the greatest protection of habitat, followed by Alternative B. Alternatives A and D and the Proposed LUP Amendment vary in protections, although Alternative A protects the smallest acres of habitat of the three, with Alternative D and the Proposed LUP Amendments comparatively close in acres protected from surface disturbance among resources.

WAFWA Management Zone II and VII

The major threats to sage-grouse habitats and populations occurring across populations in MZ II are energy development (primarily oil and gas development and supporting infrastructure), urbanization (however urbanization is of greater concern outside of the planning area in the southern part of MZ II), weeds/annual

grasses, recreation, grazing and fire (USFWS 2013). MZ II is combined with MZ VII for this analysis and acres and other values are reflected in this combination; however, MZ VII is not included in this planning area. Approximately 7.8 million acres of the sage-grouse habitat in MZ II and MZ VII is currently leased for development of federal natural gas or oil reserves. This region also has federal leases for the research of oil shale extraction overlapping the southern populations. The potential for coal mining, geothermal energy development, oil shale development, and wind energy development are also widespread throughout this MZ. In spite of these competing factors, the loss of habitat from subdivision and housing development and associated infrastructure (e.g., roads) has been identified as the greatest threat to sage-grouse populations in southern portions of MZs II and VII (USFWS 2013).

BLM managed grazing allotments not meeting wildlife standards consist of less than 5% of MZ II; however, considerable portions of this region have not been recently assessed (Manier et al. 2013). Although areas not meeting standards are not widespread in the region, the Greater Sage-Grouse Comprehensive Conservation Strategy (Stiver et al. 2006) ranked livestock grazing just below energy development and urbanization as an issue requiring immediate attention in eastern portions of the range of sage-grouse. Additionally, a large portion of central regions of this MZ (close to 5 million acres across the entire MZ) is federally managed wild horse range, suggesting potential effects to sage-grouse of livestock grazing, and the compounding effects of feral grazers need to be considered across the region. Fire risk is generally low across MZ II with about 10% of priority and general habitats at high risk for fire; however, the eastern portion of the MZ is identified as having high fire risk (Manier et al. 2013).

In the Pinedale Field Office, 20 grazing allotments (283,510 acres) (Appendix G), nearly 31% of the BLM-administered public lands surface estate, do not meet one or more of the Land Health Standards due at least in part to livestock grazing. BLM is required to assess these allotments and, when allotments are determined to be failing the Standards, to take action by the start of the next grazing season that will move the allotments toward meeting the Standards. Actions taken to move the allotments toward meeting the Standards would benefit sage-grouse habitat, although these benefits would probably take many years or decades to fully be achieved. Upland range conditions typically are slow to change in response to changes in livestock grazing management. In contrast, changes in grazing management can lead to improvements in riparian condition in as little as 3 to 5 years. Over time, changes in grazing management that lead to greater density of mid-stature perennial bunchgrasses, greater grass heights, and improved riparian conditions would benefit sage-grouse nesting and brood rearing habitats in these 20 allotments.

Cheatgrass is distributed across the region, however, generally not with the same abundance observed in the Great Basin region; some portions of this region, for example, the ownership "checkerboard" in southern Wyoming, are notably more thoroughly invaded than the cooler northwestern parts of the project area. Where severe infestation overlaps with priority and general sage-grouse habitat, management-intensive restoration may be considered. Current levels of disturbance have been sufficient to spread invasive species, and the historic combination of drought-stress and overutilization left sufficient niche space among native perennials for local proliferation. In many areas, short-term adaptations of grazing rotations to increase the cover of native perennials may be sufficient to restore high-quality habitats. Despite the perceived abundance and persistence of sagebrush in some parts of this region, extensive (or cumulative) treatments that remove sagebrush cover (even temporarily) are discouraged, unless said treatments represent a very small portion of an extensive, intact sagebrush stand (very rare) or are expressly designed to rehabilitate degraded, underutilized habitats.

These MZs span five states: MZ II contains Wyoming, Montana, Idaho, Utah, and Colorado, and MZ VII contains Utah, Colorado, and small portions of Arizona and New Mexico (USFWS 2013). There are five Greater Sage-Grouse populations within the Wyoming Basin MZ II: Jackson Hole, Laramie, Eagle-South Routt, Middle Park, and the Wyoming Basin (USFWS 2013). MZ II has the highest abundance of Greater Sage-Grouse compared to MZs within the grouse's range (USFWS 2013). The Greater Sage-Grouse leks

within this MZ have the highest connectivity networks of the MZs. The chance that the population of Greater Sage-Grouse could fall below 200 males is very low, a 3% chance by 2037 and a 16.2% chance of the population falling below 200 by 2107 (Garton et al. 2011). BLM and privately-owned lands are major constituents of sagebrush landscapes in this zone, representing 49% and 35% of the ownership, respectively (Knick 2011).

Population Isolation/Small Population Size

As the landscape is developed, populations of Greater Sage-Grouse can become isolated from habitat loss or fragmentation. The Wyoming portion of MZ II still contains extensive habitat outside of areas of energy development, but as wind and oil, gas, and CBNG leases are developed, these areas could be lost or degraded. The management to protect core/priority and general Greater Sage-Grouse habitat from surface disturbance and habitat as described under the threats of "Energy Development and Infrastructure" would also apply to this threat.

Energy Development and Infrastructure

Impacts to Greater Sage-Grouse habitat from energy development and infrastructure would result from surface-disturbing and other disruptive activities in the form of direct habitat loss or habitat fragmentation, and would likely cause long-term displacement of Greater Sage-Grouse through habitat loss and lek abandonment. The lack of undisturbed habitat in the region and throughout the MZ places additional stress on remaining habitat and the birds that rely on the habitat. Oil, gas, and coalbed methane leases, in addition to infrastructure associated with these activities that are currently in production or would be developed on valid, existing rights would add to the habitat loss and fragmentation anywhere sagebrush habitat occurs.

Seasonal restrictions on mineral development that are applied within a specified distance of leks during breeding and nesting time periods would be likely to slow rates of overall habitat loss, lek abandonment, and resulting population decline; however, these limitations would not prevent further habitat destruction from occurring. Within Alternative A, surface disturbance would be prohibited or restricted through lek buffers and seasonal restrictions, however, the Proposed LUP Amendments would prohibit surface disturbance over a much larger area compared to A and Alternative D only restricts surface disturbance. Alternatives B and C do not have quantifiable restrictions for surface but has management prohibiting overall density of disturbance which attempts to reduce habitat fragmentation and continued disturbance and loss of sage-grouse habitat.

Closing areas to oil, gas, and coalbed methane development, in addition to applying NSO and CSU restrictions to sage-grouse habitat could protect in-tact undisturbed expanses of sagebrush for sage-grouse. Alternative A and the Proposed LUP Amendments provide the same amount of closed acres, Alternative D provides slightly more acres, Alternatives B and C close the largest number of acres; with Alternative C providing the greatest area of closure to oil, gas, and coalbed methane development. Alternative B closes all priority habitat to oil, gas, and CBNG leasing, and Alternative C closes all priority and general habitat to leasing. Alternatives B and C also have the largest areas of NSO, with the Proposed LUP Amendments having more than Alternative A; Alternative D does not contain any NSO management. Seasonal restrictions in the Proposed LUP Amendments protect the largest area compared to Alternative A, with D having the least. Alternatives B and C do not have management for NSO or CSU for oil, gas, and coalbed methane development. Overall, Alternative C protects the largest area of habitat from oil, gas, and coalbed methane development and Alternatives D and A protect the least.

Infrastructure is a major threat to Greater Sage-Grouse from habitat fragmentation and habitat loss. Roads, pipelines, and transmission lines create linear disturbance and usually don't end at state lines, adding to cumulative impacts beyond the planning area. Alternative A maintains the existing exclusion and avoidance areas for ROWs and has lek buffers to prevent road and other development within proximity to Greater

Sage-Grouse leks. Alternative B excludes Greater Sage-Grouse priority habitat and existing exclusion areas from ROW development and includes infrastructure in the DDCT calculations toward the 3% disturbance threshold. Alternative C provides the greatest protection to sage-grouse habitat by excluding both priority and general habitat from ROW development. Roads would be prohibited within four miles from leks in both priority and general habitat. Alternative D would have ROW exclusion areas similar to Alternative B, but lek avoidance buffer for roads with distances similar to Alternative A. The Proposed LUP Amendments have the same ROW exclusion restrictions as Alternative A but greater lek buffer distances for disturbing activities and road development. Overall, Alternative C provides the most protection of habitat from linear disturbances and surface disturbance from infrastructure development. Alternative A could allow the most surface and linear disturbance within Greater Sage-Grouse core and general habitat.

Urbanization

The loss of habitat for sage-grouse from urban development is a major threat in the southern populations of MZs II and VII (the areas most affected by urban development are in portions of MZ II and VII that are outside of the planning area). Impacts from urbanization would depend on the local governments within and adjacent to the planning area. BLM and Forest Service management in the Amendments would not influence this threat.

Conclusion

The major threats (e.g., energy development—primarily oil and gas development and infrastructure) in MZ II and VII are affected by regulations enforced on state lands in concert with the management in these Amendments. Habitat conservation through regional efforts, threat conservation as identified in the Greater Sage-Grouse Conservation Objectives (USFWS 2013), and management proposed in these amendments (including the Wyoming Core Area Strategy) could help prevent or reduce habitat fragmentation and habitat loss. Alternative C would provide the greatest protection of habitat, followed by Alternative B. Alternatives A and D and the Proposed LUP Amendments vary in protections, although Alternative A protects the smallest acres of habitat of the three, with Alternative D and the Proposed LUP Amendments comparatively close in acres protected from surface disturbance among resources.

Transportation and Access Management

The CIAA used to analyze cumulative impacts of transportation and access includes the transportation network for the planning area, as well as roads and trails that connect to the planning area from adjacent lands. Cumulative impacts result from the implementation of surface use restrictions, which impacts the location and design of new roads. These impacts, combined with restrictions already in place for big game and Special Status Species, add to the limitations placed on access to public lands. Temporary closures and seasonal closures further reduce access. Most of these impacts would reduce transportation for permitted uses more than casual use; however, OHV use as a recreational activity would be particularly impacted under Alternatives B and C and the Proposed LUP Amendments by the closure of “open” areas. OHV “open” areas have been enormously reduced throughout the region in recent years. Removing this type of access in the few areas left could be considered a significant impact to motorized recreation users in the region.

Vegetation

The CIAA used to analyze cumulative impacts on vegetation includes the entire planning area. Cumulative impacts on vegetation would occur as a result of the increased surface disturbances (i.e., development and associated infrastructure, fences, vegetation treatments, geophysical exploration, urban expansion and subdivision of private lands, and recreation activities) within the planning area. As general use, recreation, mineral development, and other construction activities (e.g., power lines, pipelines, heavy equipment) increase as a whole throughout the planning area, so would the potential for impacts on vegetation from

vegetation loss, habitat fragmentation, soil compaction, soil erosion, and surface runoff. Development activities would also modify the composition and structure of vegetation communities and increase the potential for noxious weed infestations within disturbed areas. This would create degraded vegetation communities, which are more susceptible to disease and lower species diversity.

Oil and gas development would cause the greatest amount of surface disturbance through construction of well pads, roads, pipelines, and other facilities. Cumulative impacts would likely be greater where mineral development is more intense, in areas where development overlaps with sensitive vegetation habitat, and on state and private lands because of the lack of protections afforded to natural resources in these areas. Restoration of sagebrush habitat could take 20-30 years to achieve pre-disturbance status. With increased oil and gas developments and attendant infrastructures (e.g., power lines, compressors, pipelines, and fuel tanks) there would be a corresponding increase in the potential for dust and invasive weed introduction. In addition, increasing the amount of oil and gas development would require more habitat restoration and vegetation treatment projects.

Cumulative impacts on vegetation would occur under all alternatives due to habitat loss but they would be greatest under Alternative A because surface disturbing activities are anticipated to be greatest under this alternative. Impacts on vegetation would be the least intensive under Alternatives C because of projected decreases in surface disturbing activities and development activities, compared to all other alternatives.

Visual Resources

The CIAA used to analyze cumulative impacts on visual resource includes the entire planning area, as well as areas adjacent to the planning area that have a viewshed that includes the planning area. Past, present and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely to continue to affect visual resources are oil and gas development, mining, wind and solar energy development, road construction, cross-country vehicle travel, and vegetation treatment.

Potential impacts on VRM would result primarily from surface disturbing activities that cause visual intrusions and degrade the visual quality of the CIAA. Activities related to oil and gas development, wind energy projects, pipeline projects, and communication towers would have the potential to degrade visual resources and result in inconsistencies with VRM Class objectives. Because most of the actions in the LUP amendments are aimed at protecting sagebrush and sage-grouse habitat from surface disturbing impacts, these same actions reduce impacts to the visual characteristics of the landscape. Cumulatively, impacts from Alternative A would allow the greatest impacts to visual resources; Alternative C would provide the greatest protection.

Watershed and Water Quality

The CIAA boundary for watershed resources and water quality includes watersheds that intersect the planning area (Map 3-24). While surface-disturbing activities within the planning area are not expected to affect watershed resources and water quality outside of the planning area, watershed impacts beyond the planning area are dependent on hydrograph alteration and the quality and quantity of water flowing from the planning area.

Restrictions from surface disturbing activities related to oil and gas, coal, and mineral development, as well as wind energy development, would collectively result in the reduction in removal of vegetation, long-term reduction in overall vegetation cover, and disturbance of soils, and in turn would decrease overland flow, soil erosion, and increase the ability of a watershed to buffer high flows and filter water, sediment, and nutrients. Less soil would be mobilized by wind and water erosion, and less would be transported downslope and to nearby water bodies, which would decrease sediment and nutrient loads to streams, rivers, lakes, and reservoirs and thereby maintain water quality. Unavoidable water quality impacts could include

temporary increases in suspended load in flowing streams as a result of culvert installation, vehicle use of low-water crossings, and permitted channel fills resulting from construction of oil and gas pads, roads, and pipelines. Water quantity impacts would include water withdrawals for oil and gas and other mineral resource exploration, development and production, and watering of roads for dust mitigation. Decreases in overland flow also would directly decrease the amount of water that is transported to streams and rivers, which could lead to decreased downcutting, widening, and overall degradation of stream channels. Effects on groundwater quality and quantity would depend on the amount of oil and gas and mineral development activity in the planning area, as a result of surface disturbing restrictions and/or prohibitions.

Similarly, recreation activities, particularly OHV activity may also directly and indirectly impact water quality due to erosion and sediment production potential. However, the significance of such impacts varies with the nature and degree of disturbance as well as site specific environmental conditions. Typically larger disturbances represent greater potential to damage soils and vegetation, degrade water quality, and impair overall watershed function and condition than smaller disturbances.

Potential cumulative impacts on water resources from large vegetation treatments or habitat improvements, including prescribed fire, in the planning area would result from alteration of functional vegetative communities and could lead to increased runoff and sediment/contaminant delivery. Activities with impacts on water resources include management actions attributed to the alteration of natural vegetative communities, grazing practices, surface-disturbing actions in areas of low reclamation potential, conversion of native rangelands to irrigated agricultural lands (on non-BLM lands or non-National Forest System lands). These activities cause surface disturbances by removing vegetation cover, displacing and compacting soils, and altering soil structure and chemistry. The result is exposed surfaces that increase the potential for runoff and erosion, which delivers sediment and contaminants to nearby waterways. Sedimentation in waterways can cause changes in water chemistry as well as geomorphic adjustments that could have negative effects on stream function.

Combined with the proposed management actions, cumulative impacts would be greatest under Alternative A because of fewer restrictions on newly permitted surface disturbing activities in sage-grouse core habitat areas. Under Alternative C, increased restrictions on newly permitted surface disturbing activities would reduce the potential for surface disturbance and vegetation removal and any subsequent increases in erosion, runoff, and sedimentation of surface waters, resulting in the least intensive impacts. Cumulative impacts under Alternative B and D and the Proposed LUP Amendments would be greater than under Alternative C because of fewer restrictions on newly permitted surface disturbing activities in sage-grouse core habitat areas.

Wild Horses

The CIAA used to analyze cumulative impacts on wild horses includes the active HMAs within the planning area. Cumulative impacts would occur from a combination of activities and uses occurring within the HMAs. Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely to continue to affect wild horses are wildfires, surface-disturbing activities, the presence and abundance of grazing wildlife, increased recreational demands, and protections for sensitive resources.

Potential cumulative impacts on wild horses within the HMAs would result from a combination of activities and land uses occurring within the area. Such impacts would result primarily from surface-disturbing activities, human disturbance, and the presence of livestock that compete with wild horses for forage resources. These activities result in wild horse displacement and direct removal and indirect degradation of forage. Wild horses would directly benefit from actions to increase forage opportunities, to improve range conditions, to maintain or improve water sources, and to eliminate barriers to movement. Restrictions and

prohibitions on surface disturbing activities, as well as reclamation efforts and vegetation treatments would reduce impacts on wild horses. A reduction in development and recreation activities would decrease soil disturbances and vegetation removal, increase available forage, and decrease the displacement of wild horses. Wild horses would indirectly benefit from restrictions on motorized travel or other potentials for disturbance from people and vehicles.

Cumulative impacts would be greatest under Alternative A because of fewer restrictions on newly permitted surface disturbing activities, recreation, and mineral activities in sage-grouse priority habitat areas. Under Alternative C, increased restrictions on newly permitted surface disturbing activities, recreation, and mineral activities would reduce the potential for surface disturbance and vegetation removal and any subsequent increases in erosion, runoff, and loss of soil productivity. Cumulative impacts under Alternatives A, B, and D and the Proposed LUP Amendments would be greater than under Alternative C because of fewer restrictions on newly permitted surface disturbing activities, recreation, and mineral activities in sage-grouse priority habitat areas.

Wildland Fire

The CIAA required to analyze cumulative impacts on forestry includes the entire planning area.

Cumulative impacts on wildland fire management would occur as a result of the increased or decreased surface disturbances from development, grazing, recreation activities, and fire management occurring within the planning area. As general use, recreation, mineral development, and grazing increase as a whole throughout the planning area, potential for impacts to fire management, would increase as greater human traffic and activities would increase potential ignition sources.

Cumulative impacts from not treating sagebrush could result in a loss of a mixture of seral stages of habitat. Fuel build up from not treating sagebrush habitat with fire could increase the potential for areas of lost habitat due to wildand fires in the future, along with a loss of historic fire regimes and condition classes. There could be impacts if wildland fires occur in habitat in late seral stages or over 15% canopy cover due to the intensity and flamelength of the fires in those areas. Suppression of fires in late seral stages or over 15% canopy cover could be dangerous or prohibitive because of the intensity of the fires.

Cumulative impacts on fire management would likely occur under all alternatives largely due to surface disturbing activities but they would likely be the least under Alternative C because of the focus on restrictions in sage-grouse habitat which would be greatest under this alternative. This decrease in surface disturbing activities would transfer over to less potential for fires within the planning area. Impacts on fire management would be the most intensive under Alternatives A as management actions would allow for more surface disturbing activities and the dispersion/use of BLM/Forest Service land by the general public when compared to other alternatives.

Wildlife and Fisheries

The CIAA used to analyze potential impacts on wildlife and fisheries vary by species and the habitat they inhabit or use for migration both inside and adjacent to the planning area. Cumulative effects on wildlife and fisheries within the planning area could result primarily from surface-disturbing and other disruptive activities such as mineral and energy development and associated infrastructure (such as pipelines and transmission lines), road construction, fences of all kinds, vegetation treatments, prescribed and wildland fire, introduction and spread of non-native, invasive plant species, geophysical exploration, over grazing from livestock, drought, urban expansion and subdivision of private lands, and dispersed recreation. These activities could result in short-term and long-term habitat fragmentation and animal displacement. Habitats could become unavailable to wildlife because of human disturbance factors (e.g., traffic, noise, livestock grazing activities) during sensitive time periods such as winter, birthing, nesting, and early rearing of young.

Loss of vegetation from development activities would degrade habitat and increase forage competition among grazing animals. Livestock grazing practices would further increase cumulative impacts through direct competition for forage, water, and space, and by limiting the ability to manage vegetation for fish and wildlife needs. These impacts would also reduce the capability to maintain current population objectives.

Oil and gas development would cause the greatest amount of surface disturbance through construction of well pads, roads, pipelines, and other facilities. Reclamation and mitigation efforts would reduce impacts on wildlife habitat and fisheries; however, construction and maintenance of roads and well pads and the presence of humans would result in long-term or permanent impacts. Cumulative impacts would likely be greater where mineral development is more intense, in areas where development overlaps with crucial and winter wildlife ranges, and on state and private lands because of the lack of protections afforded to natural resources in these areas. Protection of non-federally listed species on private and state lands may not occur, resulting in potentially significant impacts on these species. As development expands throughout southwestern Wyoming, the ability of big game species to disperse into habitats outside of the planning area may become limited. This may create isolated populations in areas where habitats remain intact. The degree of impact would depend on the timing of development activities and whether the amount of activity outpaces the successful reclamation and revegetation efforts in disturbed areas. Because of this pace of development (whether federal mineral, commercial, or private residence), more pressure would be put on habitats outside of the development (likely private lands) as wildlife is displaced from the disturbances.

Impacts on wildlife would likely occur under all alternatives because of the loss of habitat. The success of disturbed land reclamation, both short- and long-term, would determine the duration of impacts. Given the constancy of all other stressors, the potential for cumulative impacts would be greatest under Alternative A because of anticipated increases in development and fewer restrictions on such activity on public lands. Under Alternative C, increased restrictions on surface disturbing activities and oil and gas development in Greater Sage-Grouse priority and general habitat would provide the greatest protection of habitat for wildlife.

4.23 GREATER SAGE-GROUSE CUMULATIVE EFFECTS ANALYSIS: WYOMING GREATER SAGE-GROUSE PLANNING AREA

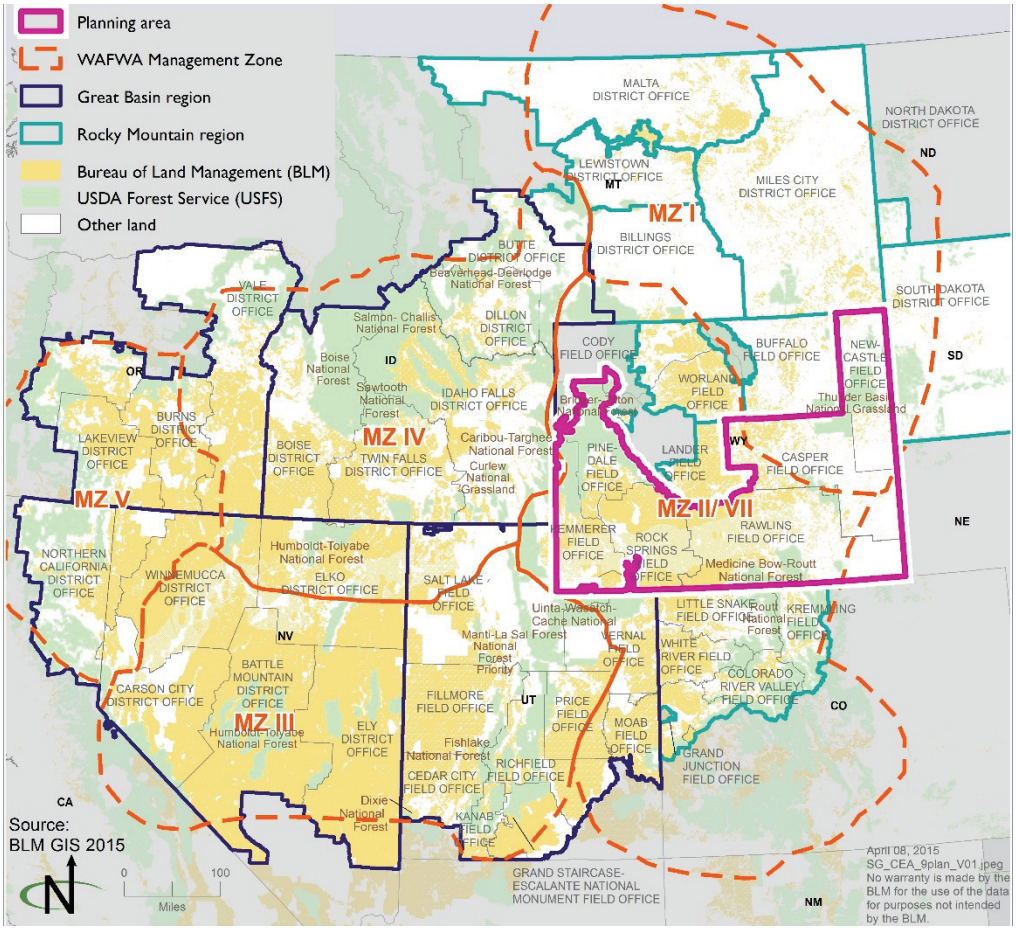
This cumulative effects analysis (CEA) discloses the long-term effects on Greater Sage-Grouse from implementing each LUP alternative, in conjunction with other past, present, and reasonably foreseeable future actions. In accordance with Council of Environmental Quality guidance, cumulative effects need to be analyzed in terms of the specific resource and ecosystem being affected (Council of Environmental Quality 1997). As discussed in Chapter 1, the purpose for the proposed federal action is to identify and incorporate appropriate conservation measures to conserve, enhance, and restore Greater Sage-Grouse habitat by reducing, eliminating, or minimizing threats to Greater Sage-Grouse habitat. The WAFWAs delineated seven sage-grouse MZs based on populations within floristic provinces (Stiver et.al. 2006). Therefore, the cumulative effects analysis study area for the Greater Sage-Grouse extends beyond the Greater Sage-Grouse LUP Amendment planning area boundary and consists of WAFWAs MZ 1, and II and VII.

MZ II and VII are combined for the purpose of characterizing Greater Sage-Grouse habitat conditions, as was done in the Summary of Science, Activities, Programs, and Policies That Influence the Range-Wide Conservation of Greater Sage-Grouse (Manier et al. 2013). The analysis of BLM and Forest Service actions in MZ I and II/VII is focused on the Greater Sage-Grouse habitat within the MZs and is primarily based on MZ-wide datasets developed by the BLM National Operations Center (NOC). Where quantitative data are not available, analysis is qualitative. This analysis includes past, present and reasonably foreseeable future actions for all land ownerships in the MZ, and evaluates the impacts of the Greater Sage-Grouse LUP Amendment, by alternative, when added to those.

The analysis of non-federal actions includes a review and analysis of the following:

- State plans
- Coordination with states and agencies during consistency reviews
- Additional data from non-BLM -administered lands and non-National Forest System lands.

The following diagram shows the boundaries of the WAFWA MZ and the Greater Sage-Grouse LUP Amendment planning area. The Greater Sage-Grouse LUP Amendment planning area has a relatively small influence in the context of MZ I because it contains relatively few PHMAs or GHMAs: 15% of PHMA and 19% of GHMA in MZ I are located within the Greater Sage-Grouse LUP Amendment planning area. As a result, actions in the Greater Sage-Grouse LUP Amendments may have less cumulative impact on Greater Sage-Grouse than those in planning areas in MZ I with more PHMA and GHMA. The planning area has a larger relative influence in the context of MZ II/VII: 57% of PHMA and 62% of GHMA in MZ II/VII are located within the Greater Sage-Grouse LUP Amendment planning area.



Section 4.23.1 describes the methods used in the analysis, and Section 4.23.2 lists assumptions used. Section 4.23.3 describes existing conditions in MZ I, II/VII and in the Greater Sage-Grouse LUP Amendment planning area. Section 4.23.4, Regional Efforts to Manage Threats to Greater Sage-Grouse, provides a broad-scale description of past, present, and reasonably foreseeable future federal, state, local, and private actions influencing Greater Sage-Grouse in MZ I and II/VII. Section 4.23.5 summarizes the relevant cumulative actions occurring in MZ I and II/VII. Section 4.23.6 analyzes threats to Greater Sage-Grouse in MZ I and discusses the potential cumulative effects resulting from each threat for each alternative. Section 4.23.7 analyzes threats to Greater Sage-Grouse in MZ II/VII and discusses the potential cumulative effects resulting from each alternative. Section 4.23.8, Conclusions, determines the cumulative effects on Greater Sage-Grouse as a result of implementing each alternative in the Greater Sage-Grouse LUP Amendment planning area, in combination with other private, local, regional, state, and federal past, present, and reasonably foreseeable future actions in MZ I and II/VII.

4.23.1 Methods

The CEA uses the following methods:

- Data from the USGS publication Summary of Science, Activities, Programs, and Policies That Influence the Range-Wide Conservation of Greater Sage-Grouse (Manier et al. 2013) establishes the baseline environmental condition against which the alternatives and other past, present, and reasonably foreseeable future actions are compared. Data from this publication are presented in terms of priority habitat and general habitat.

- USFWS's 12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered (USFWS 2010) and USFWS publication Conservation Objectives: Final Report (i.e., the COT report; USFWS 2013) were reviewed to identify the primary threats facing Greater Sage-Grouse in each WAFWA MZ. Table 2 of the COT report lists threats to Greater Sage-Grouse that are present and widespread in each population in the MZs.

- For MZ I and II/VII the list of threats that are directly or indirectly affected by BLM/Forest Service actions are energy development/mining, infrastructure, grazing, conversion to agriculture/urbanization, fire, spread of weeds, recreation, and conifers (USFWS 2013). Two other threats listed in the COT report, sagebrush eradication and isolation/small population size, affect Greater Sage-Grouse populations in MZ I and II/VII. While they are not addressed separately in this analysis, they are discussed as elements of other threats.

- Predation was not included as a threat in the final COT report and was not identified by USFWS as a significant threat to Greater Sage-Grouse populations (USFWS 2010). Predation is a natural occurrence that may be enhanced by human habitat modifications, such as construction of infrastructure that may increase opportunities for nesting and perching, or increase exposure of Greater Sage-Grouse nests. In such altered habitats, predators may exert an undue influence on Greater Sage-Grouse populations. Predation is discussed in this CEA in the context of these other threats.

- Sagebrush eradication is a component of many threats. Isolation/small population size is not analyzed separately because no management actions directly address this threat. These two threats are discussed as a component of other threats and in the conclusions. Not all the threats discussed in this section represent major threats to Greater Sage-Grouse in each planning area in the MZ, but each poses a present and widespread threat to at least one population.

- Each threat is analyzed, and a brief conclusion for each threat is provided.

  - The BLM NOC compiled MZ-wide datasets for quantifiable actions in all proposed LUPs in MZ I and II/VII. These datasets provide a means by which to quantify cumulative impacts resulting from direct impacts of the threats identified in the COT Report.
  - Data and information were gathered from other federal, state, and local agencies and tribal governments, where available, and were used to inform the analysis of cumulative impacts on Greater Sage-Grouse from each of the threats in MZ I and II/VII.
  - The tables in this cumulative effects analysis display the number of acres across the entire MZ and the percentage of those acres that are located within the LUP Amendment planning area. To calculate the total number of acres in the MZ, the number of acres in the other BLM and Forest Service proposed LUPs across MZ I and II/VII are added to the number of acres in the applicable LUP Amendment alternative. For example in MZ I, the total number of acres for Alternative A includes all of the other Proposed LUPs in MZ I plus the LUP Amendment Alternative A (the portion which overlaps with MZ I). Likewise, the Alternative B acreage includes all of the other Proposed LUPs in MZ I plus the portion of the LUP Amendment Alternative B which overlaps with the boundaries of MZ I.

- A discussion is provided for each alternative in Section 4.23.8. Each alternative considers the cumulative impacts on Greater Sage-Grouse from each of the threats. It also considers whether those threats can be ameliorated by implementing that particular alternative in conjunction with past, present, and reasonably foreseeable future actions in MZ I and II/VII.

- The list of relevant cumulative actions in Section 4.23.5 was derived from each LUP in MZ I and II/VII to provide an overview of the ongoing and proposed land uses there.

- Baseline data that are consistent across planning areas and that analyze cumulative effects for each alternative, including the No Action Alternative and Proposed LUP Amendments, are used in this analysis.

- Although PHMA and GHMA are not designated under Alternative A, spatial data was clipped to these boundaries by the BLM's NOC to provide a consistent lens for comparison across all alternatives.

- This analysis uses the most recent information available. For purposes of this analysis, the BLM and Forest Service have determined that the Proposed LUPs for other ongoing Greater Sage-Grouse planning efforts in MZ I and II/VII are reasonably foreseeable future actions.

- Some individual planning areas are located within two or more MZs. In these instances, the CEA for that planning area analyzes major threats and impacts for each MZ separately.

4.23.2 Assumptions

This cumulative analysis uses the same assumptions and indicators as those established for the analysis of direct and indirect effects on Greater Sage-Grouse as discussed in Section 4.1.3. In addition, the following assumptions have been made:

- The timeframe for this analysis is 20 years.

- The CEA area extends beyond the planning area and encompasses all of WAFWA MZ I and II/VII. The quantitative impact analysis focuses on impacts across the MZs. The MZ is the appropriate geographic scope for this analysis because it encompasses areas with similar floristic conditions containing important Greater Sage-Grouse habitat.

- The magnitude of each threat would vary geographically and may have more or less impact on Greater Sage-Grouse in some parts of the MZ, depending on such factors as climate, land use patterns, and topography.

- All acres in this analysis are presented by PHMA and GHMA, consistent with the analysis of direct and indirect impacts earlier in this EIS. The exception to this is quantitative data for the Summary of Science, Activities, Programs, and Policies That Influence the Range-Wide Conservation of Greater Sage-Grouse (Manier et al. 2013), which used Preliminary Priority Habitat (priority habitat) and Preliminary General Habitat (general habitat) to describe Greater Sage-Grouse habitat.

- In order to have consistency of analysis across the various planning areas within the MZ, the proposed Connectivity Areas have been classified as PHMA for cumulative analysis.

- A management action or alternative would result in a net conservation gain to Greater Sage-Grouse if there is an actual benefit or gain above baseline conditions. Baseline conditions are defined as the pre-existing conditions of a defined area and/or resource that can be quantified by an appropriate metric(s). During environmental reviews, the baseline is considered the affected environmental that exists at the time of the review's initiation, and is used to compare predictions of the effects of the proposed action or a reasonable range of alternatives.

- A management action within an alternative would contribute a net conservation gain to Greater Sage-Grouse if its effect is to reduce the level of a threat to Greater Sage-Grouse from the level detailed in the 2010 USFWS listing decision for Greater Sage-Grouse (USFWS 2010). A net conservation gain is equivalent to a cumulative benefit to Greater Sage-Grouse from a management action in light of the past, present, and reasonably foreseeable future actions considered in this CEA.

- The CEA quantitatively analyzes impacts on Greater Sage-Grouse and their habitat in the MZ. Impacts on habitat are likely to correspond to impacts on populations within MZ I and II/VII, because reductions or alterations in habitat could affect reproductive success through reductions in available forage or nest sites. Human activity could cause disturbance to the birds preventing them from mating or successfully rearing offspring. Human activities could also increase opportunities for predation, disease, or other stressors (Connelly et al. 2004; USFWS 2010; Manier et al 2013).

4.23.3 Existing Conditions in WAFWA MZ I, II/VII and the Greater Sage-Grouse Land Use Plan Amendment Planning Area

This section summarizes existing conditions and past and present actions in the Greater Sage-Grouse LUP Amendment planning area (provided in more detail in Chapter 3) and MZ I and II/VII as a whole. Reasonably foreseeable future actions are discussed in Section 4.23.6.

Greater Sage-Grouse Habitat and Populations

MZ I consists of four Greater Sage-Grouse populations: the Dakotas, Northern Montana, Powder River Basin, and Yellowstone Watershed (Garton et al. 2011). MZ II/VII consists of nine populations: Eagle-South Routt, Middle Park, Laramie, Jackson Hole, Wyoming Basin, Rich-Morgan, Uintah, North Park, and Northwest Colorado. MZ I and II/VII contain some of the highest-connected networks of Greater Sage-Grouse leks in the range (Knick and Hanser 2011); however, they also contains less productive sagebrush, similar to areas where Greater Sage-Grouse have been extirpated (Wisdom et al. 2011). In MZ I, sagebrush cover is naturally limited due to the dominant presence of grassland ecosystems. In combination with agricultural pressure and energy production in the Powder River Basin and extensive infrastructure, including power lines, fences, and roads (USFWS 2010), this results in substantial habitat limitations for Greater Sage-Grouse populations. In MZ II/VII, southern populations (the Colorado Plateau) are less robust, with low lek connectivity and a 96% chance of populations declining below 200 males by 2037 (Garton et al. 2011; Knick and Hanser 2011).

In MZ I, state and private lands account for approximately 35 million acres of Greater Sage-Grouse habitat (approximately 75% of habitat), with BLM-administered and other federal land accounting for only 25% of surface estate (Manier et al. 2013, p. 118). In MZ II/VII, state and private lands account for approximately 16 million acres of Greater Sage-Grouse habitat (approximately 43% of habitat), with BLM-administered and other federal land accounting for 57% (Manier et al. 2013, p. 118). The BLM also has some management authority over split-estate lands, with privately held surface and federal subsurface mineral rights for both MZs.

Table 4-110 provides a breakdown of landownership and acres of Greater Sage-Grouse habitat in MZ I and II/VII as reported in Manier et al. (2014). As the table shows, approximately 26% of priority habitat and 13% of general habitat is on BLM-administered lands in MZ I. In MZ II/VII, approximately 30% of priority habitat and 30% of general habitat is on BLM-administered lands. National Forest System lands contain 1% of general habitat and 3% of priority habitat in MZ I, and 2% of general habitat and less than 1% of priority habitat in MZ II/VII. In the Greater Sage-Grouse LUP Amendment planning area, there are approximately 26.5 million acres of Greater Sage-Grouse habitat, including approximately 10.8 million

acres (41%) on BLM-administered lands. The remaining 15.7 million acres (59%) of Greater Sage-Grouse habitat comprise private, location, state, and other federal and tribal lands.

Table 4-110. Management Jurisdiction in MZ I and II/VI by Acres of Priority and General Habitats

	Total Surface Area (Acres)	Priority (Acres)	General (Acres)	Non-habitat (Acres)
MZ I	84,110,800 (100%)	11,636,400 (14%)	34,663,000 (41%)	37,811,400 (45%)
BLM	8,325,300 (10%)	2,994,300 (26%)	4,524,900 (13%)	806,100 (10%)
Forest Service	4,532,500 (5%)	292,400 (3%)	515,300 (1%)	3,724,800 (82%)
Tribal and other federal	5,458,500 (6%)	219,700 (2%)	2,427,700 (7%)	2,811,100 (51%)
Private	54,998,900 (65%)	7,132,500 (61%)	24,682,800 (71%)	23,183,600 (42%)
State	5,421,400 (6%)	995,600 (9%)	2,498,400 (7%)	1,927,400 (36%)
Other	5,374,100 (6%)	1,900 (<1%)	13,900 (<1%)	5,358,300 (99%)
MZ II and VII	92,776,100 (100%)	17,476,000 (19%)	19,200,200 (21%)	56,099,900 (60%)
BLM	30,295,000 (33%)	9,021,200 30%)	9,012,500 (30%)	12,261,300 (40%)
Forest Service	23,558,800 (25%)	162,000 (<1%)	452,500 (2%)	22,944,300 (97%)
Tribal and other federal	7,086,200 (8%)	784,000 (11.1%)	1,354,600 (19%)	4,947,600 (51%)
Private	27,405,400 (30%)	6,233,900 (22%)	7,394,800 (27%)	13,776,700 (50%)
State	4,053,900 (4%)	1,244,800 (31%)	979,800 (24%)	1,829,300 (45%)
Other	376,700 (<1%)	30,100 (8%)	6,000 (2%)	340,600 (90%)

Source: Manier et al. 2013, p. 118.

Planning Area Habitat Conditions

Shrublands dominate the majority of lands in the planning area. These areas are diverse and include communities of greasewood, bitterbrush shrub steppe, mesic upland shrub steppe, xeric upland shrub steppe, Wyoming big sagebrush/grassland, basin big sagebrush shrubland, mountain big sagebrush/grassland, silver sagebrush/grasslands, low sages, and saltbrush.

Population Trends in Management Zone I and II/VII

Greater Sage-Grouse has been extirpated from almost half of its original range in MZ I; populations continue to decline by 2 to 4% annually (Manier et al. 2013). The MZ I Greater Sage-Grouse population was estimated to be 14,814 males in 2007, having declined 17% in the number of males per lek since 1965. The number of leks declined by 22% over the same period (Manier et al. 2013).

Wyoming state-wide data (encompassing MZ I and II/VII) suggest a cyclical pattern with population lows in 1995, 2002, and 2013 and peaks in 2000 and 2006. Actual trends are difficult to discern due to the smaller survey before 2007, meaning the number and proportion of active to inactive leks is unknown. Since 2007, the number of active leks has remained stable (approximately 1,100 active leks), but the number of males per active lek has declined by more than half, from 42 to 17. In northeast Wyoming, the decreasing number of active leks since 2007 suggests a population decline in that area, that is greater than that indicated by the average lek size. Similar population trends are suggested at both state and local scales (Christiansen 2013).

Garton et al. (2015, p. 33) found that between 2007 and 2013, the Wyoming Basin population showed a 63% decline in the estimated minimum male population attending leks.

Similarly, in Montana (MZ I), the Greater Sage-Grouse population changes cyclically. The Greater Sage-Grouse population declined sharply from 1991 to 1996, before increasing through 2000 (Montana Sage-Grouse Work Group 2005). The population is thought to be down 33% from historic levels. Between 2004 and 2013, the average number of displaying males per lek in a given year in Montana ranged from 7 to 19 (Montana's Greater Sage-Grouse Habitat Conservation Advisory Council 2014).

In the Dakotas, population counts in 2012 were approximately 300 birds (USFWS 2013). Although North and South Dakota populations remain connected to each other and to populations to the west in Montana, their small size, situation on the edge of Greater Sage-Grouse range, and ongoing threats place them at high risk (Manier et al. 2013, p. 127; USFWS 2013). Garton et al. (2015, p. 33) found that between 2007 and 2013, the Dakotas population showed a 72% decline in the estimated minimum male population attending leks.

4.23.4 Regional Efforts to Manage Threats to Greater Sage-Grouse

Regional Efforts include actions conducted by or in cooperation with agencies, organizations, landowners, or other groups in MZ I and II/VII. The boundaries of MZ I and II/VII encompass Montana, Wyoming, Colorado, Utah, Idaho, North Dakota, and South Dakota (see Map 1-4). Regional efforts occurring in these states are discussed below.

Other BLM and Forest Service Planning Efforts

As part of the Greater Sage-Grouse Rangewide Planning Effort, other BLM/Forest Service sub-regions within MZ I and MZ III/VII, as explained in Chapter 1, are undergoing LUP Amendments/EIS processes similar to this one for the Greater Sage-Grouse LUP Amendments. The Final EIS associated with each of these efforts has identified a Proposed LUP that meets the purpose and need of conserving, enhancing, and/or restoring Greater Sage-Grouse habitat by reducing, eliminating, or minimizing threats. The management actions from the various Proposed LUPs will cumulatively decrease the threat of Greater Sage-Grouse habitat loss and will limit fragmentation throughout the range. Key actions present in many of the Proposed LUPs include changes in land use allocations, an adaptive management strategy, anthropogenic disturbance cap, and protective management actions in priority and general habitat areas.

The BLM and the Forest Service have incorporated management of Sagebrush Focal Areas (SFA) into their Proposed LUP management approach for Greater Sage-Grouse. SFAs are a subset of PHMA and represent recognized "strongholds" for the species that have been noted and referenced as having the highest densities of the species and other criteria important for the species' persistence. Portions of SFAs that are located BLM-administered lands and National Forest System lands would be petitioned for withdrawal from mineral entry, and are prioritized for management and conservation actions, including, but not limited to, review of livestock grazing permits/leases. Within MZ I there is one SFA (North Central Montana), which encompasses 1,807,600 acres. Within MZ II/VII there are two SFAs (Bear River Watershed Area, and Southwestern/South Central Wyoming), totaling approximately 3,895,500 acres.

Wyoming Statewide Efforts

Wyoming has established Core Population Areas to help delineate landscape planning units by distinguishing areas of high biological value. These areas are based on the locations of breeding areas and are intended to help balance Greater Sage-Grouse habitat requirements with demand for energy development (Doherty et al. 2011).

In 2000, the Wyoming Sage-Grouse Working Group was formed to develop a statewide strategy for Greater Sage-Grouse conservation. This group prepared the Wyoming Greater Sage-Grouse Conservation Plan (Wyoming Sage-Grouse Working Group 2003) to provide coordinated management and direction across the state. In 2004, local Greater Sage-Grouse working groups were formed to develop and implement local conservation plans. Eight LWGs around Wyoming have completed conservation plans, many of which prioritize addressing past, present, and reasonably foreseeable threats at the state and local levels, and prescribe management conservation actions for private landowners to improve Greater Sage-Grouse conservation at the local scale, consistent with Wyoming's Core Population Area Strategy.

Wyoming Executive Order. Wyoming Governor Matt Mead issued an executive order on June 2, 2011 (State of Wyoming 2011), that complemented and replaced several executive orders issued by his predecessor. The 2011 Wyoming executive order articulates Wyoming's Core Population Area Strategy as an approach to balancing Greater Sage-Grouse conservation and development. It also provides an approach to mitigating human disturbances to Greater Sage-Grouse.

The Wyoming executive order applies to state trust lands starting in 2008. These trust lands cover almost 23% of Greater Sage-Grouse habitat and benefit approximately 80% of the estimated breeding population in the state (USFWS 2010). All proposed activities are evaluated through a density/disturbance calculation tool to determine if the project would exceed recommended density/disturbance thresholds. Additionally, the order has stipulations to be included in permits, with varying restrictions depending on whether the proposed development activity occurs within or outside delineated Core Population Areas (State of Wyoming 2011).

In Core Population Areas, the executive order requires a 0.6-mile NSO buffer around occupied leks, density restrictions of one location per 640 acres, a disturbance cap of 5%, and timing restrictions on activities in breeding and winter concentration habitat. This buffer provides protection of males during lekking season and acts in coordination with the density disturbance cap. The combination of protections could offer Greater Sage-Grouse considerable regulatory protection when large wind energy and other development projects are being considered in Wyoming (USFWS 2010; Manier et al. 2013).

Statewide modeling of trends under Wyoming's Core Population Area Strategy suggests that with effective enforcement statewide, the strategy could reduce population losses by 9 to 15% across Wyoming. Moreover, the number of Core Population Areas predicted to maintain 75% of their current populations could increase from 20 to 25 under long-term scenarios (Copeland et al. 2013). Combining Wyoming's Core Population Area Strategy with $250 million in target conservation easements could reduce population declines by another 9 to 11% (Copeland et al. 2013).

Sweetwater River Conservancy Habitat Conservation Bank. The Sweetwater River Conservancy Habitat Conservation Bank is the first conservation bank established for Greater Sage-Grouse. Located in central Wyoming, the bank manages habitat for Greater Sage-Grouse allowing energy development and other activities to proceed on other lands within Wyoming. A conservation bank is a site or suite of sites established under an agreement with the USFWS, intended to protect, and improve habitat for species. Credits may be purchased which result in perpetual conservation easements and conservation projects on the land to offset impacts occurring elsewhere. The Sweetwater River Conservancy Habitat Conservation Bank launched with 55,000 deeded acres of Greater Sage-Grouse habitat, and could expand up to 700,000 acres on other lands owned by the Sweetwater River Conservancy contingent upon demand (USFWS 2015).

Wyoming Landscape Conservation Initiative. The Wyoming Landscape Conservation Initiative is a long-term science based effort to assess and enhance aquatic and terrestrial habitats at a landscape scale in southwest Wyoming, while facilitating responsible development through local collaboration and partnership. Collaborative efforts address multiple concerns at a scale that considers all activities on the

landscape, and can leverage resources that might not be available for single agency projects. Greater Sage-Grouse initiatives from the Wyoming Landscape Conservation Initiative have included habitat enhancement efforts (e.g., invasive weed treatment, prescribed grazing strategies), and Greater Sage-Grouse research studies (Wyoming Landscape Conservation Initiative 2013).

Umbrella Candidate Conservation Agreement with Assurances (CCAA) for Wyoming Ranch Management. CCAAs are voluntary conservation agreements between the USFWS and one or more federal or private partners (e.g., the ranchers). In return for managing lands to benefit Greater Sage-Grouse, landowners receive assurances against additional regulatory requirements should Greater Sage-Grouse be listed under the ESA. Within Wyoming, the USFWS and Wyoming Governor's Office in conjunction with the BLM, NRCS, Forest Service, and other agencies, have developed an umbrella CCAAs for range management activities. Enrolled landowners are expected to comply with grazing specific conservation measures including but not limited to: avoid (or rotationally utilize) known nesting and brood-rearing habitat as a location for activities that concentrate livestock such as stock tank placement branding and roundup; place salt or mineral supplements in sites minimizing impacts to Greater Sage-Grouse habitat; and within 24 months develop and implement a written grazing management plan to maintain or enhance the existing plant community as suitable Greater Sage-Grouse habitat (USFWS et al. 2013).

Montana Statewide Efforts

The Montana Department of Fish, Wildlife, and Parks is tasked with implementing the range-wide WAFWA Sage-Grouse Strategy (Stiver et al. 2006) in Montana. The WAFWA Sage-Grouse Strategy outlines a plan for monitoring, research, outreach, and funding for conservation projects for Greater Sage-Grouse. A basic premise of the WAFWA Sage-Grouse Strategy is that additional conservation capacity must be developed at all local, state, federal, and range-wide levels for both the short term (3 to 5 years) and the long term (10 years or more) to ensure Greater Sage-Grouse conservation.

In addition, the Montana Department of Fish, Wildlife, and Parks *Montana Management Plan and Conservation Strategy for Sage-Grouse* was initiated in 2005 to protect, maintain, and restore Greater Sage-Grouse habitat. The plan ranks threats to the species across the state and provides an overall strategy for public and private cooperation in conservation actions. In 2013, the governor established the Greater Sage-Grouse Habitat Conservation Advisory Council to provide recommendations on policies and actions for Greater Sage-Grouse conservation and provide regulatory authority for conservation actions. The council provided these recommendations in January 2014. The governor subsequently issued an executive order on September 9, 2014 (State of Montana 2014), based on the council recommendations that provided the direction for future Greater Sage-Grouse conservation in Montana.

Montana Executive Order. The Montana governor issued an executive order on September 9, 2014 (State of Montana 2014), based on the council recommendations that provided the direction for Greater Sage-Grouse conservation in Montana. Stipulations for development in the executive order and Montana Management Plan and Conservation Strategy for Sage-Grouse include but are not limited to:

- A 0.6-mile NSO buffer around the perimeter of active leks for new activities
- Locating new overhead power lines and communication towers a minimum of 0.6 mile from the perimeter of active leks
- A minimum two-mile buffer from active lek perimeters for main roads and a minimum 0.6-mile buffer for facility site access roads
- A 5% limit on anthropogenic surface disturbance within the Density and Disturbance Calculation Tool examination area (based upon suitable habitat)

- As authorized by permitting agency or agencies, activities (production, maintenance and emergency activity exempted), will typically be prohibited from March 15 through July 15 outside of the NSO perimeter of an active lek and within two miles of that perimeter in Core Population Areas where breeding, nesting, and early brood-rearing habitat is present

The approach of the Montana executive order/Montana Management Plan and Conservation Strategy for Greater Sage-Grouse is similar to the Wyoming executive order. Montana's plan will apply a disturbance cap in core habitat and will limit well density and apply timing limitations. The 0.6-mile buffer would protect males in the vicinity of leks during the breeding season; the density limits and disturbance cap would protect Greater Sage-Grouse during nesting, brood-rearing, and winter concentration activities. The timing restrictions would reduce the potential for displacement or disruption during the breeding season.

Idaho Statewide Efforts

In 2006, Idaho developed a statewide plan for the conservation of Greater Sage-Grouse (Idaho Sage-grouse Advisory Committee 2006). The plan includes a toolbox of conservation measures to address threats to the species, as well as research, monitoring, and evaluation guidelines and recommendations. The plan was designed to provide guidance, tools, and resources to the LWGs in Idaho, and to facilitate development of their local plans. Rural Fire Protection Districts have been established within the state to help suppress fires in Greater Sage-Grouse habitat.

Similar to efforts in nearby states, the governor of Idaho is expected to issue an executive order providing direction for Greater Sage-Grouse conservation in Idaho on state lands. This executive order is expected to be largely consistent with BLM and Forest Service direction in the Greater Sage-Grouse LUP Amendments, although exact details are not known and are speculative as of the time of this Final EIS publication.

South and North Dakota Statewide Efforts

The South Dakota Department of Game, Fish, and Parks published its Sage-Grouse Management Plan in 2014. The plan calls for Greater Sage-Grouse population monitoring, harvest management, and Core area mapping. It also identifies challenges and strategies for maintaining Greater Sage-Grouse in the state, including mosquito control and incentives to private landowners (South Dakota Wildlife Division 2014).

The North Dakota Game and Fish Department is developing a draft Sage-Grouse management plan that will be finalized soon. The plan will lay out a framework to incorporate public input into conserving Greater Sage-Grouse and enhancing habitat through private-public partnerships. At this time this management plan's provisions are too speculative to rely on for purposes of this cumulative effects analysis.

Colorado Statewide Efforts

In 2008, the Colorado Division of Wildlife (now Colorado Parks and Wildlife [CPW]) developed a state conservation plan that prioritized threats and identified key issues facing conservation. The plan detailed issues, objectives, and strategies. The conservation strategies discussed responsible parties, lead agency, timeline, and cost associated with implementation of the strategy.

In 2012, a state conservation plan revision process began, and in consultation with stakeholders, a matrix summarizing implementation and effectiveness of the strategies was developed (Colorado Package), along with a subsequent Synthesis Report. The Colorado Package identified a number of conservation efforts within Colorado which have resulted in positive impacts to Greater Sage-Grouse including acquisition of conservation easements and habitat improvement projects (Colorado Department of Natural Resources 2013). The Synthesis Report provided additional information on the effectiveness of conservation efforts such as county zoning ordinances which support protection of Greater Sage-Grouse habitat, and measures

from the Colorado State Board of Land Commissioners that will support adaptive management techniques to improve Greater Sage-Grouse habitat (Colorado Department of Natural Resources 2014).

Utah Statewide Efforts

On February 25, 2015, Utah Governor Gary Herbert signed Utah Executive Order EO/2015/002. The EO directs state agencies whose action may affect Greater Sage-Grouse to implement Utah Division of Wildlife Resources' Conservation Plan for Greater Sage-Grouse in Utah (Utah Division of Wildlife Resources 2013). The plan identifies 11 Greater Sage-Grouse management areas throughout the state (including lands within MZ II/VII), which represent areas of high habitat value. The plan calls for state and local efforts to obtain incentive-based negotiated covenants, easements, leases or other legal tools in order to protect habitat. Additionally, the plan identifies a 5% disturbance limitation of habitat on state or federally managed lands, intended to limit the effects of a large scale disturbances.

Powder River Basin Restoration Program

The Powder River Basin Restoration Program is a collaborative partnership to restore and enhance Greater Sage-Grouse habitat on a landscape level in the Powder River Basin. The basin encompasses 13,493,840 acres in northeast Wyoming and southeast Montana. Surface ownership is composed of approximately 70% private lands, 14% BLM-administered lands (including 8% in Wyoming and 6% in Montana), 8% National Forest System lands, and 8% States of Wyoming and Montana lands. Subsurface mineral ownership is 50 to 60% federal (BLM 2014).

The Powder River Basin Restoration Program is focusing on areas affected by the federal oil and gas development that has occurred over the past decade in the Powder River Basin in northeastern Wyoming. Its objectives are restoring or enhancing disturbed previously suitable habitat to suitable habitat for sagebrush obligate species, primarily Greater Sage-Grouse. This includes multiple sites affected by CBNG abandonment reclamation efforts, wildfires, and noxious and invasive plants. Priority will be given to those areas recognized as priority habitats (e.g., Core Population Areas and connectivity corridors).

Habitat objectives are meeting the needs for nesting, brood-rearing, and late brood-rearing. The program would contribute to efforts focused on the management and control of mosquitoes carrying West Nile virus and would include funding, labor, treatment locations, and other needs as determined.

Additionally, efforts would be coordinated to reduce fuels in and near Greater Sage-Grouse habitat, to enhance sagebrush stands, support restoration efforts, and reduce the risk of high-severity wildfire. Pine stands and juniper woodlands would be managed for structural diversity and to reduce fuels, especially near PHMA, human developments, and recreation areas.

Natural Resource Conservation Service Sage-Grouse Initiative

The US Department of Agriculture, NRCS's Sage-Grouse Initiative (SGI) is working with private landowners in 11 western states to improve habitat for Greater Sage-Grouse (Manier et al. 2013). With approximately 31.8 million acres of Greater Sage-Grouse habitat in MZ I in private ownership, and over 13.6 million acres in MZ II/VII, (Manier et al. 2013, p. 118), a unique opportunity exists for the NRCS to benefit Greater Sage-Grouse and to ensure the persistence of large and intact rangelands by implementing long-term contracts and conservation easements.

Participation in the SGI program is voluntary, but willing participants enter into binding contracts to ensure that conservation practices that enhance Greater Sage-Grouse habitat, such as fence marking, protecting riparian areas, and maintaining vegetation in nesting areas, are implemented. Participating landowners are bound by a contract (usually 3 to 5 years) to implement, in consultation with Natural Resources

Conservation Service staff, conservation practices if they wish to receive the financial incentives offered by the SGI. These financial incentives generally take the form of payments to offset costs of implementing conservation practices and easements or rental payments for long-term conservation.

While potentially effective at conserving Greater Sage-Grouse populations and habitat on private lands, incentive-based conservation programs that fund the SGI generally require reauthorization from Congress under subsequent farm bills, meaning future funding is not guaranteed.

As of 2015, SGI has secured conservation easements on 251,600 acres within MZ II/VII, and 65,900 acres in MZ I (NRCS 2015). On these and additional private lands, SGI has completed other Greater Sage-Grouse conservation actions within MZ II/VII, including implementation of grazing systems, conifer removal, vegetation seeding, and fence marking. These conservation actions are targeted at the critical threats in each MZ, and consistent with those outlined in the COT Report. SGI clusters implementation to achieve landscape benefits.

Other Regional Efforts

A Programmatic EIS by the Western Area Power Administration (WAPA) and the USFWS for the entire upper Great Plains will focus future wind energy developments in specific corridors outside of Greater Sage-Grouse core habitat (WAPA 2013). In accordance with Section 7 of the ESA, preparation of the programmatic EIS has involved consultation between cooperating entities and the USFWS and preparation of a programmatic biological assessment to ensure that the action will not jeopardize the continued existence of any federally-listed species, including the federal candidate Greater Sage-Grouse. At the time of this RMPA specific conservation measures for protecting Greater Sage-Grouse and its habitat under the programmatic EIS are not developed.

Tribes, counties, and LWGs are playing a critical role in promoting Greater Sage-Grouse conservation at the local level. Individual conservation plans have been prepared by most LWGs to develop and implement strategies to improve or maintain Greater Sage-Grouse habitat and reduce or mitigate threats on the local level. The proposed conservation actions and recommendations in these plans are voluntary actions. The conservation plans located in Wyoming are used as instruments to inform the Wyoming executive order.

LWG projects have included monitoring, research, and mapping habitat areas, as well as public outreach efforts, such as landowner education and collaboration with federal, state, and other local entities. These efforts provide a net conservation gain to Greater Sage-Grouse through increased monitoring and public awareness.

LWG Greater Sage-Grouse conservation plans in MZ I include the following:

- Bates Hole/Shirley Basin, Wyoming (Bates Hole/Shirley Basin Sage-Grouse Conservation Plan; Bates Hole/Shirley Basin Sage-Grouse Working Group 2007)
- Bighorn Basin, Wyoming (Sage-Grouse Conservation Plan for the Bighorn Basin; Bighorn Basin Sage-Grouse LWG 2007)
- Northeast Wyoming (Powder River Basin) (Northeast Wyoming Sage-Grouse Conservation Plan Addendum; Northeast Wyoming Sage-Grouse Working Group 2014)
- Glasgow, Montana (A Summary of Conservation Activities of the Glasgow, MT Sage-Grouse LWG; Montana LWGs 2011a)

- Miles City/Forsyth, Montana (Miles City Sage-Grouse LWG Action Plan 2011-2014; Montana LWGs 2011b)
- Central Montana Organized Conservation District (no local conservation plan)
- North Dakota (no local conservation plan)
- South Dakota (no local conservation plan)

LWG Greater Sage-Grouse conservation plans in MZ II/VII include the following:

- Northwest Colorado (Northwest Colorado Greater Sage-Grouse Conservation Plan; Northwest Colorado Greater Sage-Grouse Working Group 2008)
- Piceance/Parachute Roan Creek, Colorado (Parachute-Piceance-Roan Greater Sage-Grouse Conservation Plan; Parachute-Piceance-Roan Greater Sage-Grouse Work Group 2008)
- Northern Eagle/Southern Routt, Colorado (Northern Eagle County and Southern Routt County Greater Sage-Grouse Conservation Plan; Northern Eagle County and Southern Routt County Sage-Grouse Work Group 2004)
- North Park, Colorado (North Park Greater Sage-Grouse Conservation Plan; North Park Sage-Grouse Working Group 2001)
- Middle Park, Colorado (Middle Park Sage-Grouse Conservation Plan; Middle Park Sage-Grouse Working Group 2001)
- Rich County, Utah (Rich County Sage-Grouse Conservation Plan; Rich County Coordinated Resource Management Sage-Grouse Subcommittee 2006)
- Morgan-Summit, Utah (Morgan-Summit Greater Sage-Grouse Local Conservation Plan; Morgan-Summit Adaptive Resource Management LWG 2006)
- Uintah Basin, Utah (Uinta Basin Greater Sage-Grouse Local Conservation Plan; Uinta Basin Adaptive Resource Management LWG 2007)
- Upper Green River Basin, Wyoming (Upper Green River Basin Sage-Grouse Grouse Conservation Plan; Upper Green River Basin Sage-Grouse Working Group 2007)
- Upper Snake River Basin, Wyoming (Upper Snake River Basin Sage-Grouse Conservation Plan; Upper Snake River Basin Sage-Grouse Working Group 2008)
- Wind River/Sweetwater River Basin, Wyoming (Wind River/Sweetwater River Local Sage-Grouse Conservation Plan; Wind River/Sweetwater River Basin Local Sage-Grouse Working Group 2007)
- Southwest Wyoming (Southwest Wyoming Sage-Grouse Conservation Assessment and Plan; Southwest Wyoming Local Sage-Grouse Working Group 2007)
- South-Central Wyoming (South Central Sage-Grouse Conservation Plan; South Central Sage-Grouse Working Group 2007)

- Bates Hole/Shirley Basin, Wyoming (Bates Hole/Shirley Basin Sage-Grouse Conservation Plan; Bates Hole/Shirley Basin Sage-Grouse Working Group 2007)
- Bighorn Basin, Wyoming (Sage-Grouse Conservation Plan for the Bighorn Basin; Bighorn Basin Sage-Grouse LWG 2007)

4.23.5 Relevant Cumulative Actions

This cumulative effects analysis considers the incremental impact of the Proposed LUP Amendments and alternatives in combination with other past, present, and reasonably foreseeable future federal and non-federal actions on all lands in MZ I and II/VII. Where these actions occur within Greater Sage-Grouse habitat, they would cumulatively add to the impacts of BLM- and Forest Service authorized activities set forth in the Proposed LUP Amendments. In addition to the conservation efforts described above, relevant reasonably foreseeable future cumulative actions occurring on federal, private, or mixed landownership in MZ I and II/VII are described in the LUPs for the following planning areas: HiLine, Lewistown, Miles City, Billings, North Dakota, South Dakota, Bighorn Basin, Buffalo, Lander, Greater Sage-Grouse LUP Amendment planning area, Northwest Colorado, Idaho and Southwestern Montana, and Utah. Actions may occur on federal, state, private, or mixed landownership.

The following list includes large-scale past, present, and reasonably foreseeable future actions in MZ I that, when added to the Proposed LUP Amendments and alternatives for the LUP Amendment planning area, could cumulatively affect Greater Sage-Grouse (see Tables 4-109 and 4-131) for more detail):

- Powder River Basin oil and gas leases in Campbell, Johnson, and Sheridan Counties, Wyoming
- Surface coal mining and coal leasing in Powder River Basin, Wyoming
- Carter Master Leasing Plan for Oil and Gas, Carter County, Montana
- Surface coal leasing in northeast Montana, Big Dry RMP area
- Greater Crossbow Oil and Gas Exploration and Development Project in Campbell and Converse Counties, Wyoming
- Converse County Oil and Gas Development, Converse County, Wyoming
- Nichols Ranch/Hank Unit Uranium In-situ Recovery Mining Project, Johnson and Campbell Counties, Wyoming
- Proposed uranium mining in Newcastle, Wyoming, and in South Dakota
- WAPA Upper Great Plains Wind Energy Programmatic Draft EIS
- Bentonite mining in northeast Wyoming and in Carter County, Montana
- Keystone XL Pipeline, Montana and South Dakota
- Conversion of lands to agricultural and urban development
- Conifer removal

The following list includes large-scale past, present, and future actions in MZ II/VII that could cumulatively affect Greater Sage-Grouse (see Tables 4-109 and 4-132 for more detail):

- Hiawatha Regional Energy Development EIS
- LaBarge Platform Exploration and Development Project
- Continental Divide-Creston Natural Gas Project
- Moneta Divide Natural Gas and Oil Development Project
- Pinedale Anticline Project
- Black Fork Project (formerly Moxa Arch Area Infill)
- Oil Shale and Tar Sands Programmatic EIS
- Atlantic Rim Natural Gas Field Development Project
- Chokecherry Sierra Madre Wind Farm
- Gateway South Transmission Line Project
- TransWest Express Transmission Line Project
- Gateway West Transmission Line Project
- Riley Ridge o Natrona Pipeline Project
- Invasive Plant Management EIS for the Medicine Bow – Routt National Forests, and TBNG
- Normal-Pressured Lance Natural Gas EIS
- Bird Canyon Field Infill EIS

These projects are incorporated into the following analysis as the relevant past, present, and reasonably foreseeable future projects associated with each threat to Greater Sage-Grouse in MZ I and II/VII.

4.23.6 Threats to Greater Sage-Grouse in Management Zone I

In its COT report, USFWS identifies energy development, infrastructure, grazing, conversion to agriculture, fire, spread of weeds, and recreation as the "present and widespread" threats facing Greater Sage-Grouse in MZ I (USFWS 2013). These threats impact Greater Sage-Grouse mainly by fragmenting and degrading their habitat. The loss of sagebrush steppe across the West approaches or exceeds 50% in some areas. Habitat fragmentation and degradation is a primary factor in long-term declines in Greater Sage-Grouse abundance across its historical range (USFWS 2010).

Habitat fragmentation reduces connectivity of populations and increases the likelihood of extirpation from random events such as drought or outbreak of West Nile virus. Furthermore, climate change is likely to affect habitat availability to some degree by decreasing summer flows and limiting growth of grasses and forbs, thereby limiting water and food supply (BLM 2012). Sensitive species such as Greater Sage-Grouse,

which are already stressed by declining habitat, increased development, and other factors, could experience additional pressures as a result of climate change.

Each COT report threat considered present and widespread in at least one population in MZ I is discussed below. For more detail on the nature and type of effects and the direct and indirect impacts on Greater Sage-Grouse in the planning area, see Chapter 4 of the Greater Sage-Grouse LUP Amendments.

Energy Development and Mining

The COT Report states that energy development should be designed to ensure that it will not impinge on stable or increasing Greater Sage-Grouse population trends. For mining, the COT objective is to maintain stable to increasing Greater Sage-Grouse populations and no net loss of Greater Sage-Grouse habitats in areas affected by mining (USFWS 2013). In the energy development areas of MZ I, population trends are not stable or increasing; for this reason, objectives in the planning area are intended to reduce losses and sustain a viable Greater Sage-Grouse population, albeit at a lower level than historically (Taylor et al. 2012).

There are approximately 1,004,400 acres of Greater Sage-Grouse habitat in MZ I where energy and mineral development (including oil and gas, coal leasing, mineral materials, and non-energy leasable minerals) is presently occurring. There are 33,264,000 acres indirectly influenced by energy development (Manier et al. 2013, pp. 55-71). No geothermal energy development is presently occurring in MZ I.

Oil and Gas

Nature and Type of Effects. As discussed in Chapter 4, oil and gas development impacts Greater Sage-Grouse and sagebrush habitats through direct disturbance and habitat loss from well pads, access construction, seismic surveys, roads, power lines, and pipeline corridors. Indirect disturbances result from noise, gaseous emissions, changes in water availability and quality, and human presence. These factors could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004; Holloran 2005).

Oil and gas development results in direct loss of habitat from well pad and road construction as well as indirect disturbance impacts from increased noise and vehicle traffic. This development can also impact Greater Sage-Grouse survival or reproductive success. Indirect effects include avoidance of infrastructure, habitat quality changes, predator communities, and disease dynamics (Naugle et al. 2011).

Several studies from the Great Plains and Wyoming Basin have shown that breeding Greater Sage-Grouse populations are affected at oil and gas well densities commonly permitted in Montana and Wyoming (Naugle et al. 2011). Doherty et al. (2010) found that although impacts were indiscernible at densities of less than one well per square mile, lek losses in parts of MZ I were two to five times greater in areas with development above this threshold. They also found that the abundance (number) of males per lek at the remaining leks declined by approximately 30 to 80%. These and other studies demonstrate that both direct and indirect impacts result from the impacts of energy development and geophysical exploration in Greater Sage-Grouse habitat.

Several studies have quantified the distance from leks at which impacts of development become negligible. The studies also assessed the efficacy of BLM NSO stipulations for leasing and development within 0.25 mile of a lek (Holloran 2005; Walker et al. 2007). Walker et al. (2007) found that in the Powder River Basin buffer sizes of 0.25, 0.5, 0.6, and 1 mile resulted in an estimated lek persistence (the ability of leks to remain on the landscape) of approximately 5, 10, 15, and 30%, respectively; conversely, lek persistence in areas without oil and gas development averaged approximately 85%.

Naugle et al. (2011) reported that impacts of energy development had been documented at distances greater than 3.5 miles from the lek in MZ I. Holloran (2005) found impacts on abundance at a distance between 3 and 4 miles in western Wyoming. However, Naugle et al. (2011) also stated that impacts on leks caused by energy development were most severe near the lek.

Naugle et al. (2011) also found that impacts from energy development often extirpate leks in gas fields. Doherty (2008) documented that lek losses increased and male abundance decreased as well density increased in the Powder River Basin. Lek extirpation in areas with 8 wells per section (40 to 100 wells total) within 2 miles of the lek was five times more likely to occur than in areas with no wells within 2 miles. Male attendance at the remaining leks in these areas declined approximately 20 to 60% (Doherty 2008).

Much oil and gas development previously occurred on private lands with minimal mitigation efforts, but restrictions are now in place to protect Greater Sage-Grouse habitat under the Wyoming and Montana executive orders. Earlier research had demonstrated that 0.25-mile NSO lease stipulations were insufficient to conserve breeding Greater Sage-Grouse populations in Wyoming and Montana (Walker et al. 2007), when nearly 100% of the area within approximately 2 miles of leks remained open to full-scale development.

Lyon and Anderson (2003) reported that oil and gas development influenced the rate of nest initiation of Greater Sage-Grouse in excess of approximately 2 miles of construction activities. Greater Sage-Grouse numbers on leks within approximately 1 mile of natural gas compressor stations in Campbell County, Wyoming, were consistently lower than numbers on leks unaffected by this noise disturbance (Braun et al. 2002). Holloran and Anderson (2005) reported that lek activity decreased downwind of drilling activities, suggesting that noise caused measurable impacts.

In addition to activities directly associated with oil and gas development, road traffic also generates noise. Knick et al. (2003) indicated that there were no active Greater Sage-Grouse leks within approximately 1 mile of Interstate 80 across southern Wyoming; only 9 leks were known to occur between approximately 1 and 2.5 miles of Interstate 80.

Conditions in MZ I. Energy development is a widespread threat to Greater Sage-Grouse in the planning area and in many parts of MZ I. The patchwork landownership pattern in MZ I means that many energy extraction facilities are near property boundaries and may affect Greater Sage-Grouse and their habitat on adjacent lands. Nearly 16% of Greater Sage-Grouse habitat in MZ I is within 1.8 miles of oil and gas wells, a distance at which ecological impacts are likely to occur (Knick et al. 2011).

Oil and natural gas development-related wells indirectly influence 60% of priority and general habitats across MZ I, occurring to a distance of 12 miles from the development. Private surface lands account for 65% of wells in priority habitat and 72% in general habitat in MZ I (Manier et al. 2013). Thus, conservation actions on private land are likely to have a greater potential to ameliorate the effects of oil and gas development on Greater Sage-Grouse habitat than any other single land management entity.

Although oil and gas activities have a disproportionately greater effect on private lands (as the majority of wells in priority and general habitat are located on private land as discussed above), regulatory mechanisms on both federal surface and split-estate lands in MZ I are influential. Federal actions on split-estate lands with federal subsurface minerals will require mitigation for impacts on Greater Sage-Grouse habitat occurring on private surface lands that would not be required on lands with both privately held surface and subsurface.

From 2001 to 2005, Greater Sage-Grouse populations declined by 82% within the expansive CBNG fields in northeast Wyoming (Walker et al. 2007). This reduced the options for delineating large and intact Core Population Areas containing an abundance of high-quality Greater Sage-Grouse habitats.

Oil and gas development has emerged as a range-wide issue in conservation because areas being developed contain large Greater Sage-Grouse populations (Connelly et al. 2004) and other sagebrush obligate species (Knick et al. 2003).

Existing leases on BLM-administered lands and National Forest System lands in Greater Sage-Grouse habitat remain valid. There is a potential for future development based on locations of geologic fields distributed extensively across eastern portions of Greater Sage-Grouse range (Manier et al. 2013).

The Dakotas population in MZ I is heavily influenced by oil and gas development; oil and gas developments are scattered throughout the Yellowstone watershed (USFWS 2013, p. 63). The Powder River Basin contains substantial energy resources, including oil, natural gas, and CBNG (USFWS 2013, pp. 64-65); conversely, the Northern Montana population has little energy development. Coalbed methane wells typically last 12 to 18 years, while oil and gas wells may last 20 to 100 years in production (Connelly et al. 2004). Most CBNG drilling in the Powder River Basin has concluded, and current and future oil and gas development is anticipated to impact Greater Sage-Grouse less due to horizontal drilling technology.

Impact Analysis. Table 4-111 and Table 4-112 provide a quantitative summary of present fluid mineral leasing conditions on BLM-administered lands and National Forest System lands under the Greater Sage-Grouse LUP Amendments alternatives and across MZ I. An analysis of this summary along with other past, present, and reasonably foreseeable actions in MZ I (see Tables 4-109 and 4-131) follows.

As stated under Section 4.23.1, Methods, and Section 4.23.2, Assumptions, acreages in these tables are limited to BLM-administered lands and National Forest System lands and always assume implementation of Proposed RMPs/LUPs in other planning areas across MZ I.

Table 4-111. Acres Open* and Closed to Fluid Mineral Leasing in Greater Sage-Grouse Habitat in MZ 1

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open* to Fluid Mineral Leasing				
Alternative A	358,000	100%	2,745,000	61%
Alternative B	0	0%	2,745,000	61%
Alternative C	0	0%	1,075,000	0%
Alternative D	319,000	100%	2,745,000	61%
Proposed LUP Amendments	0	0%	2,642,000	59%
Closed to Fluid Mineral Leasing				
Alternative A	184,000	39%	157,000	43%
Alternative B	1,437,000	92%	207,000	57%
Alternative C	1,437,000	92%	2,991,000	97%
Alternative D	226,000	50%	157,000	43%

	Priority Habitat Management Areas		General Habitat Management Areas	
Proposed LUP Amendments	184,000	39%	157,000	43%

Source: BLM 2015
*Open with standard lease terms and conditions. This table displays the acres of PHMA and GHMA open and closed to fluid mineral leasing in MZ I; it also displays the percentage of those acres that are found within the planning area.

Table 4-112. Acres with NSO and CSU/TL Stipulations in Greater Sage-Grouse Habitat in MZ 1

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
NSO Stipulations				
Alternative A	6,611,000	4%	1,287,000	10%
Alternative B	6,456,000	0%	1,276,000	10%
Alternative C	3,456,000	0%	1,153,000	0%
Alternative D	3,609,000	4%	1,287,000	10%
Proposed LUP Amendments	3,626,000	5%	1,281,000	10%
CSU/TL Stipulations				
Alternative A	1,312,000	56%	5,174,000	20%
Alternative B	574,000	0%	5,135,000	19%
Alternative C	574,000	0%	4,149,000	0%
Alternative D	1,312,000	56%	5,174,000	20%
Proposed LUP Amendments	1,707,000	66%	5,251,000	21%

Source: BLM 2015
This table displays the acres of PHMA and GHMA with NSO Stipulations and CSU/TL Stipulations in MZ I; it also displays the percentage of those acres that are found within the planning area.

Actions such as establishing 0.6-mile lek buffers in PHMA, (0.25-mile lek buffers in GHMA), applying the disturbance cap, and implementing CSU/TL stipulations within the Greater Sage-Grouse LUP Amendment planning area would help reduce the threat of oil and gas development within the MZ.

Under Alternative A, 383,000 acres of PHMA in MZ I would be open to fluid mineral leasing under standard terms and conditions (all of which would be located in the Greater Sage-Grouse LUP Amendment planning area). Additionally, 2,745,000 acres of GHMA would be open to leasing in the MZ. Under current management, various stipulations apply to leased and unleased fluid minerals within MZ I; however, many are not specific to Greater Sage-Grouse. The lack of protective restrictions in these areas would increase the potential for harm or disturbance associated with new leasing projects. Impacts such as removal, degradation, and fragmentation of habitat; increased risk for the spread of weeds; noise disturbance; and lek abandonment may occur. Greater Sage-Grouse would be most vulnerable to disturbance from oil and gas leasing and development in the Greater Sage-Grouse LUP Amendment planning area; implementing other BLM/Forest Service Proposed LUPs throughout the remainder of the MZ would result in greater long-term protections on BLM-administered lands and National Forest System lands in those areas. Conservation actions at the state and local level (e.g., the Wyoming and Montana executive orders, and private

conservation easements) would complement other BLM and/or Forest Service Proposed LUPs while oil and gas related past, present, and reasonably foreseeable future actions that cause surface disturbance would result in a continued threat to Greater Sage-Grouse, specifically within the planning area.

Acres of PHMA and GHMA closed to fluid mineral leasing in MZ I would be greatest under Alternative B and C. As such, there would not be oil and gas development in these areas, reducing the potential impacts to Greater Sage-Grouse populations. The risk of habitat fragmentation or disturbance due to new oil and gas development would be reduced. The incremental effect of implementing Alternative B and C in conjunction with BLM/Forest Service Proposed LUPs elsewhere in the MZ and the past, present, and reasonably foreseeable future actions disclosed in Tables 4-109 and 4-131 would result in a net conservation gain.

Under Alternative D, 319,000 acres of PHMA and 2,745,000 acres of GHMA would be open to fluid mineral leasing with standard terms and conditions. Reasonably foreseeable future leasing projects would be less restricted in Greater Sage-Grouse habitat under this alternative compared to the other action alternatives, which could increase the risk of habitat fragmentation or disturbance, particularly within the Greater Sage-Grouse LUP Amendment planning area. Implementation of the BLM/Forest Service Proposed LUPs in other planning areas would help ameliorate the threat of oil and gas development in those areas, but this alternative would result in a lower net conservation gain than Alternative B, C, or the Proposed LUP Amendments.

Under the Proposed LUP Amendments, no PHMA in MZ I would be open to fluid mineral leasing with standard terms and conditions; approximately 2,642,000 acres of GHMA would be open. Closing a portion of PHMA to fluid mineral leasing and applying major or moderate stipulations in much of PHMA and GHMA would benefit Greater Sage-Grouse by limiting new development in important habitat areas. While new oil and gas development is likely to occur on lands not administered by the BLM or National Forest System, such projects may be subject to the requirements of the Wyoming executive order and other state plans, which would limit disturbance. Timing limitations specific to the LUP Amendment planning area would help to protect breeding, nesting, and early brood rearing habitats, and contribute to the MZ-wide protection of the Greater Sage-Grouse. For example, in Core Population Areas, surface disturbing and/or disruptive activities would be prohibited between March 15 through June 30; in connectivity areas within PHMAs, surface disturbing and/or disruptive activities would be prohibited within 4 miles of the lek or lek perimeter within the same timeframe. Timing limitations would also apply to leks located outside of PHMAs, within a 2-mile buffer. Additionally, approximately 33,400 acres of habitat managed as GHMA in Alternatives A through D would be managed as PHMA on the TBNG under the Proposed LUP Amendments. The incremental effects of implementing the Proposed LUP Amendments in conjunction with other Greater Sage-Grouse conservation actions in MZ I would be a net conservation gain for Greater Sage-Grouse because of the additional restrictions in important habitat areas, and the additional acres of habitat managed as PHMA compared to all other alternatives.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming executive orders) could be synergistic, meaning that the effects of the actions together is greater than the sum of their individual effects. For example, applying buffers in PHMA and on state and private land would effectively conserve larger blocks of land than if these actions occurred individually. This would provide a landscape-scale net conservation benefit, especially in areas where little development has occurred to date.

All BLM/Forest Service Proposed LUPs within MZ I include BMPs and RDFs to minimize impacts on Greater Sage-Grouse from oil and gas development on federal lands. In areas where mineral estate is currently unleased, these tools can be applied to future leases; in areas which are already leased, BMPs can be applied as COAs for development of existing leases. Examples include: locating new compressor stations

outside of PHMA to reduce noise disturbance; clustering operations and facilities as closely as possible; placing infrastructure in already disturbed locations where the habitat has not been fully restored; and restoring disturbed areas at final reclamation to the pre-disturbance landforms and desired plant communities. State plans contain similar measures to reduce impacts. Together, these measures would help protect unfragmented habitats, minimize habitat loss and fragmentation, and maintain conditions that meet Greater Sage-Grouse life history needs. Recent research indicates that restored habitats lack many of the features sought by Greater Sage-Grouse in their habitat areas, and may not support Greater Sage-Grouse for long periods following restoration activities. In order to conserve Greater Sage-Grouse populations on the landscape, protection of existing habitat through minimizing development, would provide the best hope for Greater Sage-Grouse persistence (Arkle et al. 2014).

Implementation of the Proposed LUP Amendments within the Greater Sage-Grouse LUP Amendment planning area, in combination with other BLM/Forest Service planning efforts and other Greater Sage-Grouse conservation plans within MZ I could affect proposed oil and gas development projects. Large-scale oil and gas projects which could potentially occur on Greater Sage-Grouse habitat within MZ I (such as the Greater Crossbow and Converse County Oil and Gas projects as discussed in Tables 4-109 and 4-131) would be subject to the disturbance cap limitation requirements of the Wyoming executive order and/or BLM/Forest Service Proposed LUPs. NSO and CSU/TL stipulations would also apply in Greater Sage-Grouse habitat on BLM-administered lands and National Forest System lands. On split-estate lands, oil and gas operators are subject to COAs, prior to drilling, which allows the BLM the opportunity to attach Greater Sage-Grouse protective measures to drilling permits. These restrictions would contribute to the net conservation gain of any alternative because they would limit development in important habitat areas. All action alternatives and the Proposed LUP Amendments would reopen the Powder River Basin to leasing, which is currently closed to new leasing by court order. Development pressure for fluid mineral resources in the Dakotas, Powder River Basin, and Yellowstone Watershed is likely to continue; however, future drilling technologies are expected to impact Greater Sage-Grouse less than CBNG development has in the past decade. Because leasing restrictions (e.g., closures in PHMAs and NSO stipulations) under the Proposed LUPs in the MZ would not preclude existing leases in PHMAs and GHMAs from being developed, reasonably foreseeable future projects for oil and gas development are likely to affect Greater Sage-Grouse and sagebrush habitats. However, mitigation requirements in BLM/Forest Service LUPs and state and other Greater Sage-Grouse conservation plans would offset disturbances from future projects and result in a net conservation gain for Greater Sage-Grouse.

Reasonably foreseeable oil and gas development is widespread in the MZ. When the impacts of the LUP Amendment are added to these actions, the impact would be a net conservation gain due in large part to implementation of NSO stipulations, anthropogenic disturbance caps, and adaptive management that would minimize future disturbance to Greater Sage-Grouse populations and habitats.

Coal

Nature and Type of Effects. Past and current coal extraction has been and continues to be a major mining activity in Greater Sage-Grouse habitat (Braun 1998), and environmental effects include soil erosion, dust, noise, water pollution, acid-mine drainage, and air emissions. These environmental effects can result in Greater Sage-Grouse behavioral disruptions and habitat removal or degradation. Although land disturbed by coal mining can be restored to a point that supports a diversity of vegetation, including big sagebrush, reclamation projects require long durations, and Greater Sage-Grouse habitat may fail to be restored (Arkle et al. 2014).

Conditions in MZ I. Coal developments are common throughout MZ I, especially in the Powder River Basin (Wyoming and Montana) which contains some of the largest accumulations of low-sulfur sub-

bituminous coal in the world. It is the nation's largest coal-producing region, and coal from the region is shipped nationwide.

Coal surface leases indirectly influence 3 to 8% of priority habitat and general habitat respectively across MZ I. Approximately 68% of coal leases in priority habitat (and 82% in general habitat) occur on private lands within MZ I (Manier et al. 2013). Therefore, conservation actions on private land are likely to have a greater potential to ameliorate the effects of coal development on Greater Sage-Grouse than any other single land management entity.

Impact Analysis. Coal development would continue on existing leases under all alternatives. Existing leases located within or in proximity to Greater Sage-Grouse habitat (including connectivity corridors) may continue to affect Greater Sage-Grouse through noise disturbance and vehicle collision risk. Coal development in the Powder River Basin would likely continue under all alternatives and the Proposed LUP Amendments. However, under the action alternatives and the Proposed LUP Amendments, all appropriate RDFs would be applied as mandatory Stipulations/COAs within PHMA for coal exploration. These measures would help to minimize surface disturbing activities and noise for coal exploration activities in PHMA, and would afford greater protection of Greater Sage-Grouse compared to Alternative A.

Under Alternatives B and C, no new underground mining leases would be granted unless all surface disturbances (e.g., appurtenant facilities) are placed outside of PHMA. Where new appurtenant facilities associated with an existing lease cannot be located outside PHMA, new facilities would be co-located within existing disturbed areas. If this is not possible, any new appurtenant facilities would be constructed to the absolute minimum standard necessary. These measures would limit new disturbance associated with coal development in PHMA on BLM-administered lands and National Forest System lands.

Under the Proposed LUP Amendments, coal exploration activities could be allowed in PHMA if they can be completed in compliance with surface occupancy and disturbance and density stipulations analyzed through the DDCT. This would help to maintain contiguous blocks of suitable habitat for Greater Sage-Grouse.

Under all alternatives and the Proposed LUP Amendments, new coal lease applications on federal mineral estate would be subject to suitability determinations governed by 43 CFR, Part 3461.5. Under unsuitability criterion 15, the BLM may determine that portions of the MZ contain essential Greater Sage-Grouse habitat and are unsuitable for all or certain stipulated methods of coal mining. If the BLM made this determination, it would apply stipulations to restrict coal mining and protect Greater Sage-Grouse, including possibly prohibiting surface coal mining. As such, the regulations under Criterion 15 of 43 CFR, Part 3461.5(o)(1) would reduce the potential for long-term impacts associated with new coal leasing projects on Greater Sage-Grouse habitats and populations.

New coal leasing and development may also occur on non-federal lands in MZ I, subject to state regulations (include reclamation requirements). Additionally, new coal leasing in Wyoming and Montana would be subject to the surface disturbance limit as outlined in the Wyoming and Montana executive orders. These measures would help protect Greater Sage-Grouse habitat on lands where 43 CFR, Part 3461.5(o)(1) do not apply. The regulatory requirements of 43 CFR, Part 3461.5, Criterion 15, in combination with BLM/Forest Service planning efforts and state plans, would help reduce the threat from coal extraction and would provide a net conservation gain to Greater Sage-Grouse in MZ I.

Mineral Materials

Nature and Type of Effects. Development of surface mines (for sand, gravel and other common mineral materials found in MZ I) may negatively impact Greater Sage-Grouse numbers and disrupt the habitat and life-cycle of the species, similar to other types of mining activities (Braun 1998; Manier et al. 2013).

Conditions in MZ I. Salable mineral materials disposal sites in PHMA and GHMA are widespread throughout much of MZ I. They are primarily located in northeast Wyoming, with an additional concentration in far southeast Montana. There are 65,000 acres of mining and mineral materials disposal sites (not including minerals mined as energy sources) on BLM-administered surface land in MZ I. There are 122,900 acres across all landownership types. (Manier et al. 2013).

Across MZ I, PHMA and GHMA are most affected by mining and mineral materials disposal sites on private land surface. Greater Sage-Grouse may be directly impacted, being in the path of development; however, indirect impacts on habitat affect a much wider population of birds. In total, 53% of priority habitat and 80% of general habitat influenced by the indirect impact of mining and mineral materials disposal sites are on private land. This does not include minerals mined as energy sources. Mining and mineral materials disposal sites on BLM-administered surface land, by comparison, indirectly affect 38% of priority habitat and 11% of general habitat (Manier et al. 2013).

Impact Analysis. Table 4-113, Acres Open and Closed to Mineral Material Disposal in Greater Sage-Grouse Habitat in MZ I, shows acres of PHMA and GHMA open and closed to mineral material disposal by alternative.

Table 4-113. Acres Open and Closed to Mineral Material Disposal in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Mineral Material Disposal				
Alternative A	1,799,000	68%	8,467,000	33%
Alternative B	571,000	0%	8,417,000	32%
Alternative C	571,000	0%	8,417,000	32%
Alternative D	1,799,000	68%	8,467,000	33%
Proposed LUP Amendments	1,845,000	69%	8,421,000	32%
Closed to Mineral Material Disposal				
Alternative A	3,865,000	2%	700,000	10%
Alternative B	5,093,000	26%	750,000	16%
Alternative C	5,093,000	26%	750,000	16%
Alternative D	3,865,000	2%	700,000	10%
Proposed LUP Amendments	3,865,000	2%	700,000	10%

Source: BLM 2015
This table displays the acres of PHMA and GHMA open and closed to mineral material disposal in MZ I; it also displays the percentage of those acres that are found within the planning area.

Under Alternative A, 3,865,000 acres of PHMA would be closed to mineral material disposal in MZ I, and 700,000 acres of GHMA would be closed. In PHMA, 1,799,000 acres would remain open, as would 8,467,000 acres of GHMA. Reasonably foreseeable future mineral material disposals in MZ I could affect Greater Sage-Grouse through habitat disturbance, fragmentation, or behavior disruptions, depending on the location and extent of the project; however, implementation of BLM/Forest Service Proposed LUPs in other areas of MZ I would restrict development, thereby reducing the risk of removing or fragmenting habitat elsewhere in MZ I, particularly on BLM-administered lands and National Forest System lands. There would

be a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I, but it would be concentrated in areas outside the Greater Sage-Grouse LUP Amendment planning area.

Under Alternatives B and C, 5,093,000 acres of PHMA and 750,000 acres of GHMA would be closed to mineral material disposal. Of all alternatives and the Proposed LUP Amendments, Alternatives B and C would be the most restrictive in terms of mineral material disposal within Greater Sage-Grouse habitat on BLM-administered lands and National Forest System lands. The closures under Alternative B and C would benefit Greater Sage-Grouse by protecting habitat and limiting new mineral material developments. However, designating Greater Sage-Grouse habitat as open or closed to mineral material disposal would not preclude existing facilities from continued operation. In areas where existing facilities affect Greater Sage-Grouse (e.g., through noise disturbance or vehicle collision risk), these impacts would likely continue.

Under Alternative D, 1,799,000 acres of PHMA and 8,467,000 acres of GHMA would be open to mineral material disposal. Impacts to Greater Sage-Grouse would be the same as those described under Alternative A.

Under the Proposed LUP Amendments, acres of PHMA and GHMA closed to mineral material disposal would be the same as under Alternatives A and D. The majority (69%) of PHMA open to mineral material disposal would be located within the Greater Sage-Grouse LUP Amendment planning area. Habitat disturbance, fragmentation, or behavior disruptions would likely occur. However, salable mineral activities in PHMA would be subject to the disturbance and density stipulations analyzed through the DDCT process. Mineral material development on non-BLM-administered lands and non-National Forest System lands would also be subject to the disturbance and density stipulations of the Wyoming executive order, which would encourage development in areas away from PHMA or core habitat. When combined with other regional efforts (e.g., Wyoming and Montana executive orders), BLM and Forest Service management under the Proposed LUP Amendments would have a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I, although this gain would be less compared to Alternatives B and C, as these alternatives would implement more extensive restrictions.

Locatable Minerals

Nature and Type of Effects. Locatable minerals include gold, silver, uranium, gypsum, and bentonite. Activities associated with locatable mineral development, such as stockpiling topsoil and extracting and transporting material, would cause mortality and nest disruption. These actions also would reduce the functionality of the surrounding habitat with noise and light disturbance, resulting in lost and degraded Greater Sage-Grouse PHMA and GHMA.

As with fluid mineral development, reclamation practices may help to reduce long-term impacts on Greater Sage-Grouse and their habitat. Although disturbed areas have not been restored to near pre-disturbance conditions in the past, recent efforts have been directed toward restoring functional habitat. Future reclamation should be focused on restoring habitats capable of supporting viable Greater Sage-Grouse populations. Even with effective restoration, restored areas may not support Greater Sage-Grouse populations at the same level as prior to disturbance (Arkle et al. 2014).

Conditions in MZ I. The primary locatable minerals in commercially viable quantities in MZ I are sodium bentonite, gypsum, and uranium. Most current and forecasted extraction activities are for sodium bentonite, but uranium is also being mined in MZ I. In the event of a price increase, uranium mining activity would likely increase in Greater Sage-Grouse habitat.

Impact Analysis. Table 4-114, Acres Open and Recommended for Withdrawal from Mineral Entry in Greater Sage-Grouse Habitat in MZ I, shows acres of PHMA and GHMA open and recommended for withdrawal within MZ I and the percent of those acres occurring in the planning area.

Table 4-114. Acres Open and Recommended for Withdrawal from Mineral Entry in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Mineral Entry				
Alternative A	4,034,000	30%	7,236,000	38%
Alternative B	2,822,000	0%	7,186,000	37%
Alternative C	2,822,000	0%	7,186,000	37%
Alternative D	4,034,000	30%	7,236,000	38%
Proposed LUP Amendments	4,080,000	31%	7,190,000	37%
Recommended for Withdrawal from Locatable Mineral Entry				
Alternative A	1,085,000	8%	118,000	50%
Alternative B	2,296,000	56%	168,000	65%
Alternative C	2,296,000	56%	168,000	65%
Alternative D	1,085,000	8%	118,000	50%
Proposed LUP Amendments	1,085,000	8%	121,000	52%

Source: BLM 2015
This table displays the acres of PHMA and GHMA open to mineral entry and recommended for withdrawal from locatable mineral entry in MZ I; it also displays the percentage of those acres that are found within the planning area.

Under Alternatives A and D, 1,085,000 acres of PHMA and 118,000 acres of GHMA would be recommended for withdrawal in MZ I. Under the Proposed LUP Amendments, the same number of acres of PHMA would be recommended for withdrawal and 121,000 acres of GHMA would be recommended for withdrawal. Recommending withdrawal of Greater Sage-Grouse habitat from locatable mineral entry would restrict exploration or development of unclaimed lands, which would reduce the potential for impacts to sagebrush habitats. Existing claims in PHMA and GHMA would remain valid subject to existing rights determinations. If developed, these lands may result in impacts such as habitat disturbance and fragmentation.

Alternatives B and C would recommend the greatest number of acres of PHMA and GHMA for withdrawal from mineral entry in MZ I. These alternatives would therefore afford the greatest protection to Greater Sage-Grouse habitat and populations on federal land. However, they may drive mineral entry onto adjacent lands with fewer protections for Greater Sage-Grouse.

Under all alternatives and the Proposed LUP Amendments, BMPs would help minimize impacts on Greater Sage-Grouse from locatable mineral development on BLM-administered lands and National Forest Service System lands. All BLM/Forest Service Proposed LUPs within MZ I include BMPs, such as clustering operations and facilities as closely as possible, placing infrastructure in already disturbed locations where the habitat has not been fully restored, and restoring disturbed areas at final reclamation to the pre-disturbance landforms and desired plant communities.

Implementation of the Proposed LUP Amendments and all other BLM/Forest Service Proposed LUPs in MZ I includes recommending SFAs for mineral withdrawal. This is especially important for Greater Sage-

Grouse because SFAs contain key habitat strongholds. However, the total acreage proposed for withdrawal is less than under Alternatives B and C.

Implementation of any alternative or the Proposed LUP Amendments would result in a net conservation gain to Greater Sage-Grouse populations by reducing disturbance to birds from human activity and habitat fragmentation caused by mining. Alternatives B and C would result in the largest net conservation gain, as these alternatives would recommend the most acres of PHMA and GHMA for withdrawal from mineral entry.

Non-energy Leasable Minerals

Nature and Type of Effects. Non-energy leasable minerals are materials such as sulfates, silicates, and trona (sodium carbonate). Impacts on Greater Sage-Grouse are similar to those from other types of mining.

Conditions in MZ I. In MZ I, existing federal mineral prospecting permits for non-energy leasable resources have a direct footprint on 10,400 acres of priority habitat and 28,200 of general habitat (Manier et al. 2013, p. 79).

Impact Analysis. Table 4-115, Acres Open and Closed to Non-energy Leasable Mineral Leasing in Greater Sage-Grouse Habitat in MZ I, shows the acres of PHMA and GHMA open and closed to non-energy leasing in MZ I, and the percent of those acres occurring within the planning area.

Table 4-115. Acres Open and Closed to Non-energy Leasable Mineral Leasing in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Non-energy Leasing				
Alternative A	762,000	0%	6,487,000	42%
Alternative B	762,000	0%	6,487,000	42%
Alternative C	2,003,000	62%	6,537,000	42%
Alternative D	2,049,000	63%	6,491,000	42%
Proposed LUP Amendments	762,000	0%	6,487,000	42%
Closed to Non-energy Leasing				
Alternative A	2,564,000	3%	670,000	10%
Alternative B	3,805,000	34%	720,000	16%
Alternative C	3,805,000	34%	720,000	16%
Alternative D	2,564,000	3%	670,000	10%
Proposed LUP Amendments	2,564,000	3%	670,000	10%

Source: BLM 2015
This table displays the acres of PHMA and GHMA open and closed to non-energy leasing in MZ I; it also displays the percentage of those acres that are found within the planning area.

Under Alternatives A, D, and the Proposed LUP Amendments, 2,564,000 acres of PHMA and 670,000 acres of GHMA would be closed to non-energy leasing in MZ I. New non-energy leasable projects occurring in Greater Sage-Grouse habitat could impact Greater Sage-Grouse and their habitat, depending on the location and extent of the development. Precluding non-energy leasable development in PHMA and

GHMA would reduce habitat disturbance and fragmentation as well as direct disturbance to Greater Sage-Grouse, improving the likelihood of successful breeding and reproduction. Under Alternatives B and C, additional acres of PHMA and GHMA would be closed to non-energy leasing. These alternatives would afford the greatest protection of Greater Sage-Grouse habitat on federal lands.

Implementing a surface disturbance cap under all action alternatives would limit non-energy mineral development over the long term and help maintain contiguous sagebrush habitats. As a result, in combination with the disturbance cap applied under state plans, BLM/Forest Service actions in other planning areas in MZ I, and other past, present, and reasonably foreseeable future actions, all action alternatives would result in a net conservation gain to Greater Sage-Grouse habitats and populations.

Infrastructure

The USFWS (2013) considers energy development and associated infrastructure the largest threats to Greater Sage-Grouse in MZ I. The COT Report objective is to avoid development of infrastructure in Greater Sage-Grouse priority areas for conservation.

Rights-of-Way and Special Use Authorizations

Nature and Type of Effects. As discussed in Chapter 4, power lines can directly affect Greater Sage-Grouse by posing a collision and electrocution hazard. They also can indirectly decrease lek attendance and recruitment by providing perches and nesting habitat for potential avian predators, such as golden eagles and ravens (Connelly et al. 2004). In addition, power lines and pipelines often extend for many miles. The ground disturbance associated with construction, as well as vehicle and human presence on maintenance roads, may introduce or spread invasive weeds over large areas, degrading habitat. Impacts from roads may include direct habitat loss from road construction and direct mortality from collisions with vehicles. Roads may also facilitate predator movements, spread invasive plants, and increase human disturbance from noise and traffic (Forman and Alexander 1998).

Conditions in MZ I Infrastructure, such as ROWs and associated facilities and urbanization, is widespread throughout MZ I. In some locations, infrastructure development has affected Greater Sage-Grouse habitat through the introduction of roads, fences, and utility corridors that contribute to habitat loss and fragmentation. The best available estimates suggest about 16% of the MZ I is within approximately 4 miles of urban development (Knick et al. 2011). Impacts of infrastructure development in MZ I are primarily related to highways, roads, power lines, and communication towers, with nearly 90% of MZ I within 4 miles of a road, 30% within 4 miles of a power line, and 4% within 4 miles of a communication tower (Knick et al. 2011).

Although not representative of all infrastructure ROWs, transmission lines greater than 115 kilovolts indirectly influence 29% of priority habitat and 46% of general habitat across MZ I. Indirect effects are assumed to occur to a radius of 4 miles (Manier et al. 2013). Approximately 68% of transmission lines in priority habitat and 73% in general habitat are on private lands across Greater Sage-Grouse habitats in MZ I (Manier et al. 2013). Therefore, conservation actions on private lands are likely to have a greater potential to affect transmission line ROWs in Greater Sage-Grouse habitat than any other land management entity.

Impact Analysis. Table 4-116, Acres of ROW/SUA Management in Greater Sage-Grouse Habitat in MZ I, lists the areas of ROW/SUA avoidance and exclusion in Greater Sage-Grouse habitat by alternative.

Table 4-116. Acres of Rights-of-Way/Special Use Authorization Management in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Rights-of-Way/Special Use Authorizations				
Alternative A	509,000	99%	949,000	57%
Alternative B	5,000	0%	408,000	0%
Alternative C	5,000	0%	408,000	0%
Alternative D	5,000	0%	932,000	56%
Proposed LUP Amendments	5,000	0%	932,000	56%
Right-of-Way/Special Use Authorization Exclusion				
Alternative A	119,000	27%	148,000	22%
Alternative B	775,000	89%	202,000	43%
Alternative C	775,000	89%	897,000	87%
Alternative D	775,000	89%	202,000	43%
Proposed LUP Amendments	119,000	27%	148,000	22%
Right-of-Way/Special Use Authorization Avoidance				
Alternative A	2,894,000	5%	2,395,000	9%
Alternative B	2,742,000	0%	2,883,000	24%
Alternative C	2,742,000	0%	2,189,000	0%
Alternative D	2,742,000	0%	2,359,000	7%
Proposed LUP Amendments	3,449,000	20%	2,363,000	7%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within ROW/SUA management areas in MZ I; it also displays the percentage of those acres that are found within the planning area.

Exclusion and avoidance areas are intended to minimize disturbance to Greater Sage-Grouse populations by limiting the siting of roads and other ROWs/SUAs which can increase bird mortality, habitat avoidance, habitat fragmentation. Additionally, the location of tall structures can increase predation (Connelly et al. 2004). These impacts would be most prevalent under Alternative A, as this alternative has the most acres of PHMA open to ROWs/SUAs and the fewest areas managed as ROW/SUA avoidance and exclusion within MZ I. Exclusion areas would strictly prohibit ROW/SUA development, while avoidance areas may allow ROW/SUA development subject to restrictions and mitigation.

Under Alternative B, an increase in avoidance and exclusion management areas (compared to Alternative A) would help protect Greater Sage-Grouse habitat on BLM-administered lands and National Forest System lands. The incremental effects of implementing Alternative B, combined with the density and disturbance cap provisions of the Wyoming and Montana executive orders would result in a net conservation gain to Greater Sage-Grouse habitats and populations.

Alternative C would be the most restrictive in terms of avoiding or excluding new ROWs/SUAs in Greater Sage-Grouse habitat. As such PHMA and GHMA on BLM-administered lands and National Forest System lands would be protected from new ROW/SUA developments; however, non-federal lands could be at greater risk for development as these areas would have less restrictive management. Regional efforts which specifically target private lands (such as the SGI and Montana and Wyoming executive orders) would help to offset this indirect effect. The incremental effects of implementing Alternative C combined with the density and disturbance cap provisions of the Wyoming and Montana executive orders would result in a net conservation gain to Greater Sage-Grouse habitats and populations.

Acres of ROW/SUA exclusion under Alternative D would be the same as Alternative B. Fewer acres of GHMA would be managed as ROW/SUA avoidance, therefore, this alternative would afford less protection compared to B.

The Proposed LUP Amendments would rely more on ROW/SUA avoidance areas to protect Greater Sage-Grouse habitat rather than ROW/SUA exclusion. The Proposed LUP Amendments would designate the most acres of PHMA as ROW avoidance of all alternatives. This approach preserves management flexibility in situations where landownership is mixed and may help avoid rerouting ROWs/SUAs across non-federal land when those routes would disturb more Greater Sage-Grouse habitat than if the ROW was located solely on BLM-administered lands or National Forest System lands. The incremental effect of implementing the Proposed LUP Amendments, including the anthropogenic disturbance cap, in conjunction with past, present and reasonably foreseeable future actions would be a reduction of Greater Sage-Grouse leks, nests, and brood-rearing and wintering areas compared to current management.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming executive order) could be synergistic. By implementing restrictions on infrastructure in PHMA and on state and private lands together, the cumulative beneficial effect on Greater Sage-Grouse would be greater than the sum of their individual effects because protections would be applied more consistently across the landscape. This is especially important in areas of mixed land ownership patterns where complementary protections can benefit leks, early brood rearing habitat, or other important areas that do not follow geopolitical boundaries.

As part of the Greater Sage-Grouse Rangewide Planning Effort, other BLM and Forest Service planning areas, as explained in Chapter 1, are undergoing LUP Amendments/EIS processes similar to this one for the Greater Sage-Grouse LUP Amendments. The Final EIS associated with each of these efforts has identified a Proposed LUP that meets the purpose and need of conserving, enhancing, and/or restoring Greater Sage-Grouse habitat by reducing, eliminating, or minimizing threats. The management actions from the various Proposed LUPs will cumulatively decrease the threat of Greater Sage-Grouse habitat loss and will limit fragmentation throughout the range. Key actions present in many of the Proposed LUPs include an adaptive management strategy, anthropogenic disturbance cap, and lek buffers. The cumulative effect of these actions, when added to the direct and indirect effects identified above, will be a reduction in the historic rate of fragmentation and loss of Greater Sage-Grouse habitat.

Renewable Energy

Nature and Type of Effects. Impacts on Greater Sage-Grouse from renewable energy development, such as that for wind and solar power, are similar to those from nonrenewable energy development. Additional concerns associated with wind energy developments are rotor blade noise, structure avoidance, and mortality caused by collisions with turbines (Connelly et al. 2004).

Conditions in MZ I. Wind energy development is a growing presence in MZ I. Though wind turbines indirectly influence 1% of priority habitat and general habitat across MZ I, private lands account for 72%

of wind turbines affecting Greater Sage-Grouse in priority habitat and 87% in general habitat in MZ I (Manier et al. 2013). Therefore, conservation actions on private land are likely to have a greater potential to reduce the effects of wind energy development than federal actions. A programmatic EIS by the WAPA and the DOE for the entire upper Great Plains will focus future wind energy developments in specific corridors outside of Greater Sage-Grouse core habitat (WAPA 2013).

Impact Analysis. Table 4-117, Acres of Wind Energy Management areas in Greater Sage-Grouse Habitat in MZ I, lists acres of PHMA and GHMA managed as open, avoidance, or exclusion to wind ROWs/SUAs.

Table 4-117. Acres of Wind Energy Management Areas in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open to Wind Rights-of-Way//Special Use Authorization				
Alternative A	378,000	100%	679,000	90%
Alternative B	0	0%	67,000	0%
Alternative C	0	0%	67,000	0%
Alternative D	0	0%	646,000	90%
Proposed LUP Amendments	2,000	100%	655,000	90%
Wind Right-of-Way//Special Use Authorization Exclusion				
Alternative A	2,793,000	1%	479,000	7%
Alternative B	3,453,000	20%	533,000	16%
Alternative C	3,453,000	20%	1,228,000	64%
Alternative D	3,453,000	20%	533,000	16%
Proposed LUP Amendments	2,793,000	1%	479,000	7%
Wind Right-of-Way//Special Use Authorization Avoidance				
Alternative A	354,000	81%	2,303,000	6%
Alternative B	69,000	0%	2,868,000	24%
Alternative C	69,000	0%	2,174,000	0%
Alternative D	69,000	0%	2,281,000	5%
Proposed LUP Amendments	776,000	91%	2,285,000	5%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within wind energy management areas in MZ I; it also displays the percentage of those acres that are found within the planning area.

Managing wind ROW/SUA avoidance and exclusion areas in Greater Sage-Grouse habitat would reduce or minimize impacts from wind utility infrastructure on BLM-administered lands and or National Forest System lands by prohibiting or restricting new ROWs/SUAs. In addition, renewals or upgrades of existing facilities could incorporate additional conservation actions. Collocation or clustering of facilities would reduce impacts on Greater Sage-Grouse habitat. Managing wind ROW/SUA exclusion and avoidance areas would not preclude existing renewable energy projects from operating.

Under Alternative A, 378,000 acres of PHMA in MZ I would be open to wind ROWs/SUAs, and 679,000 acres of GHMA would be managed as open to wind ROWs/SUAs. Maintaining PHMA as open to wind ROWs/SUAs would increase the risk of development in these areas, as there would be fewer restrictions in place on BLM-administered lands and National Forest System lands to protect Greater Sage-Grouse.

Under Alternative B, no PHMA in MZ I would be open to wind ROW/SUAs. Therefore, this alternative would provide greater protection to Greater Sage-Grouse habitats and populations compared to Alternative A. While wind developments may still occur in Greater Sage-Grouse habitat under Alternative B, avoidance and exclusion management areas would minimize impacts and/or encourage development outside of PHMA. The incremental effects of implementing Alternative B in combination with other regional efforts would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I.

Alternative C would manage the most acres of wind ROW/SUA exclusion in MZ I, and would be the most restrictive in allowing developments on BLM and National Forest System lands. Wind ROW/SUA exclusion areas would limit the risk of new renewable energy facilities impacting Greater Sage-Grouse; however, non-federal lands could be at greater risk for development as these areas would have less restrictive management. Implementation of the Wyoming and Montana executive orders would help to offset this indirect effect because wind developments in those two states would also be subject to restrictions. When combined with other regional efforts including implementation of other Proposed LUPs, Alternative C would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I.

Under Alternative D, acres of wind ROW/SUA exclusion areas would be similar to Alternative B. Managing wind ROW/SUA exclusion areas in PHMA and GHMA would encourage development away from important Greater Sage-Grouse habitat, which would help to protect sagebrush habitats. When compared to Alternatives B and C, 579,000 additional acres of GHMA would be managed as open to wind ROWs/SUAs. Habitat disturbance and fragmentation would be more likely to occur in these areas. When combined with other regional efforts including implementation of other Proposed LUPs, Alternative D would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I.

Under the Proposed LUP Amendments, additional acres of PHMA and GHMA would be managed as wind ROW/SUA exclusion when compared to current management, which would benefit Greater Sage-Grouse by limiting wind facilities and associated infrastructure in important habitat areas. The cumulative effect of reasonably foreseeable future wind energy projects and other ROW/SUA developments in MZ I may result in localized impacts to Greater Sage-Grouse such as direct mortality, habitat removal or degradation, and lek abandonment.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming executive order) could be synergistic. By implementing restrictions on infrastructure in PHMA and on state and private lands together, the cumulative beneficial effect on Greater Sage-Grouse would be greater than the sum of their individual effects because protections would be applied more consistently across the landscape. This is especially important in areas of mixed land ownership patterns where complementary protections can benefit leks, early brood rearing habitat, or other important areas that do not follow geopolitical boundaries.

Impacts would be minimized on BLM-administered land across all alternatives and the Proposed LUP Amendments by adhering to the wildlife protection provisions of the Wind Energy Development Programmatic EIS (BLM 2005). Management of wind energy ROW/SUA avoidance in PHMA for all BLM/Forest Service Proposed LUPs, in combination with the disturbance caps under the state plans, exclusion zones in other BLM/Forest Service planning areas and other past, present, and reasonably

foreseeable future actions, would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I.

Grazing

Nature and Type of Effects. The remaining sagebrush habitats in MZ1 are mostly managed as grazing lands for domestic livestock. Domestic livestock function similarly to the native keystone species bison in the MZ through grazing and management actions related to grazing, by serving as the predominant large herbivore in the ecosystem. Grazing actions do not preclude wildlife and vegetation, but they do influence ecological pathways and species persistence (Bock et al. 1993).

In general, livestock can influence habitat by modifying plant biomass, plant height and cover, and plant species composition. As a result, livestock grazing could cause changes in habitat that alter species abundances and composition in Greater Sage-Grouse insect prey important to young Greater Sage-Grouse chicks. Changes in plant composition could occur in varying degrees and could change vegetative structure, affecting cover for nesting birds. Grazing could also alter fire regimes (Davies et al. 2010).

If not managed properly, cattle and sheep grazing can compact soil, enrich soil with nutrients, trample vegetation and nests, directly disturb Greater Sage-Grouse, and negatively affect Greater Sage-Grouse recruitment. Improper cattle and sheep grazing can also reduce invertebrate prey for Greater Sage-Grouse or increase their exposure to predators (Beck and Mitchell 2000, pp. 998-1,000; Knick 2011; Coates 2007, pp. 28-33). Excessive grazing in riparian areas can destabilize streams and riverbanks, cause the loss of riparian shade, and increase sediment and nutrient loads in the aquatic ecosystem (George et al. 2011). Stock watering tanks can contribute to stream and aquifer dewatering and may concentrate livestock movement and congregation in sensitive areas (Vance and Stagliano 2007).

Even periodic overgrazing can damage range resources over the long term. Grazing often exacerbates drought effects when stocking levels are not quickly reduced to match the limited forage production. Excessive grazing can eliminate perennial grasses and lead to expansion of invasive species such as cheatgrass or Japanese brome (Reisner et al. 2013). The degree to which grazing affects habitat depends on several factors, such as the types of grasses being grazed, the amount of moisture in any given year, the number of animals grazing in an area, the time of grazing, and the grazing system used.

However, grazing can be used to reduce fuel load and reduce the risk of wildfire (Connelly et al. 2004, p. 7, 28-30). Under certain conditions, grazing can reduce the spread of invasive grasses, if applied early in the season before the grasses have dried (Strand and Launchbaugh 2013). Light to moderate grazing does not appear to affect perennial grasses, which are important to nest cover (Strand and Launchbaugh 2013).

Much of the landscape in MZ I is adapted to withstand grazing disturbance, having been grazed by bison before the West was settled (Knick et al. 2011). Since the passage of the 1934 Taylor Grazing Act, range conditions on BLM-administered lands have generally improved due to improved grazing management practices, decreased livestock numbers, and decreased duration of grazing.

In addition, the BLM has applied Standards for Rangeland Health since 1997. The purpose of this practice is to enhance sustainable livestock grazing and wildlife habitat, while protecting watersheds and riparian ecosystems. On National Forest System lands, livestock grazing is administered in accordance to a number of laws and regulations, including the Multiple Use and Sustained Yield Act of 1960, Granger-Thye Act of 1950, and Organic Administration Act of 1897.

Although livestock grazing is the most widespread land use across the sagebrush biome, it exerts a more limited influence on soils and vegetation than land uses that remove or fragment habitat (e.g., mineral extraction or infrastructure development). Greater Sage-Grouse are able to co-exist with grazing animals

when properly managed. Thus, reducing AUMs or acres open to grazing would not necessarily restore high-quality Greater Sage-Grouse habitat.

Livestock grazing could reduce the suitability of breeding and brood-rearing habitat for Greater Sage-Grouse populations (USFWS 2010). Reducing grass height in Greater Sage-Grouse nesting and brood-rearing areas may negatively impact nesting success. Studies have showed such impacts when residual herbaceous cover was reduced below the approximately 7 inches needed for predator avoidance (Gregg et al. 1994, Doherty et al. 2014). However, grazing is only one component of grass height, which is also influenced by soil and weather conditions. For BLM-administered lands, Standards for Rangeland Health require the BLM to ensure that the environment contains all of the necessary components to support viable populations of sensitive, threatened, and endangered species in a given area relative to site potential. The BLM Washington Office IM 2009-018 requires that land health considerations, such as vegetation cover for Greater Sage-Grouse, are primary considerations for prioritizing the processing of grazing authorizations.

Grazing shapes wildlife habitats, including habitats for numerous Special Status Species. Potential impacts from livestock grazing would be minimized by managing BLM-administered lands to meet Standards for Rangeland Health, closing areas that fail to meet these standards, or changing grazing seasons and livestock numbers if grazing were a cause of the area's failure to meet Standards for Rangeland Health.

Range improvements could result in livestock overusing important Greater Sage-Grouse areas. For example, developing springs would generally change vegetative composition from a high diversity of grasses and forbs, important to broods, to one dominated by grasses.

Allowing spring developments along ephemeral streams and wetlands would decrease Greater Sage-Grouse habitat. Springs, seeps, and wetland areas are vitally important to Greater Sage-Grouse broods; therefore, allowing spring developments could reduce resources for Greater Sage-Grouse.

Conditions in MZ I. Livestock grazing is the dominant agricultural use in the Great Plains. It is widespread on many land types, including federal and private, across MZ I. Remaining sagebrush habitats in MZ I are mostly managed as grazing lands for domestic livestock. Much of the landscape in MZ I is adapted to withstand grazing disturbance, having been grazed by bison before the West was settled (Knick et al. 2011).

Perhaps the most pervasive change associated with grazing management in Greater Sage-Grouse habitats throughout MZ I is the construction of fencing and water developments (Knick et al. 2011). Barbed wire fences contribute to direct mortality through fence collisions (Stevens et al. 2011); water developments may contribute to the increased occurrence of West Nile virus (Walker and Naugle 2011). Fencing is common throughout MZ I; water developments are particularly prevalent in the north-central portion of MZ I, making that area especially susceptible to West Nile virus outbreaks.

Additional habitat modifications associated with grazing management are mechanical and chemical treatments to increase grass production, often by removing sagebrush (Knick et al. 2011). Standards for Rangeland Health protect habitat from elements detrimental to Greater Sage-Grouse, but not all rangelands in MZ I are in compliance with these standards.

Impact Analysis. Table 4-118 lists the acres of PHMA and GHMA available and unavailable for grazing, by alternative.

Table 4-118. Acres Available and Unavailable to Livestock Grazing in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Available to Livestock Grazing				
Alternative A	3,522,000	20%	3,457,000	23%
Alternative B	3,522,000	20%	3,457,000	23%
Alternative C	2,834,000	0%	3,403,000	21%
Alternative D	3,522,000	20%	3,457,000	23%
Proposed LUP Amendments	3,573,000	21%	3,407,000	21%
Unavailable to Livestock Grazing				
Alternative A	3,000	33%	8,000	13%
Alternative B	3,000	33%	8,000	13%
Alternative C	691,000	99%	61,000	90%
Alternative D	3,000	33%	8,000	13%
Proposed LUP Amendments	3,000	33%	8,000	13%

Source: BLM 2015
This table displays the acres of PHMA and GHMA available and unavailable to livestock grazing in MZ I; it also displays the percentage of those acres that are found within the planning area.

Except for Alternative C, the number of acres of PHMA and GHMA available and unavailable to livestock grazing would be similar across alternatives. Under Alternative C, there would be fewer acres available to grazing, with a corresponding increase in acres unavailable to livestock grazing. These restrictions would help to protect Greater Sage-Grouse habitat from the risk of improper grazing on BLM-administered lands and National Forest System lands; however, greater restrictions on BLM-administered lands and National Forest System lands could increase grazing pressure on adjacent private lands.

As literature suggests that moderate grazing is compatible with Greater Sage-Grouse habitat (Strand and Launchbaugh 2013), closing acres to grazing may not itself benefit or harm Greater Sage-Grouse. As described above under *Nature and Type of Impacts*, possibly equally or more beneficial is restricting range improvements in Greater Sage-Grouse habitat, limiting fencing, and effectively implementing range health standards on grazing allotments in Greater Sage-Grouse habitat. As a result, the relatively large acreage unavailable for grazing under Alternative C may not provide the greatest benefit to Greater Sage-Grouse. Making such a large acreage unavailable may also simply push grazing practices onto adjacent lands with fewer protections for Greater Sage-Grouse, thus offsetting potential gains made on federal lands.

The COT report objectives for livestock grazing are to manage grazing in a manner consistent with local ecological conditions. This type of management would maintain or restore healthy sagebrush shrub and native perennial grass and forb communities and conserve essential habitat components for Greater Sage-Grouse. The COT report also states that land managers should avoid or reduce the impact of range management structures on Greater Sage-Grouse habitat.

Under the Proposed LUP Amendments, management actions specifically related to Greater Sage-Grouse would help reduce the threat of grazing throughout the MZ to meet the COT report objectives. For example, the BLM will prioritize (1) the review of grazing permits/leases, in particular to determine if modification is necessary prior to renewal, and (2) the processing of grazing permits/leases in SFAs followed by PHMAs outside of the SFAs. Proposed LUPs in MZ I would also prioritize SFAs for grazing permit renewals. These actions would provide an opportunity to adjust forage levels to meet rangeland health standards, thereby reducing the risk of nonfunctioning rangelands impacting Greater Sage-Grouse habitats throughout MZ I. Additionally, under the Proposed LUP Amendments existing range improvements (e.g., fences, livestock/wildlife watering facilities) in GHMA and PHMA would continue to be evaluated and modified when necessary.

Similar Greater Sage-Grouse conservation measures are included under Alternatives B, D, and C. For example, under Alternative B, in PHMA, existing structural range improvements and location of supplements (salt or protein blocks) would be evaluated to make sure they conserve, enhance, or restore Greater Sage-Grouse habitat. The same management action would apply under Alternative C to both PHMA and GHMA. Under Alternative D, in Greater Sage-Grouse core and connectivity habitats, existing range improvements associated with grazing management operations would continue to be evaluated and modified when necessary for reduced impacts on Greater Sage-Grouse and its habitat. Under Alternative D, in Greater Sage-Grouse GHMA, core, and connectivity habitats, existing range improvements (e.g., fences, livestock/wildlife watering facilities) associated with grazing management operations would continue to be evaluated and modified when necessary for reducing impacts on Greater Sage-Grouse and its habitat.

BLM/Forest Service grazing management actions in MZ I would not apply on non-federal lands. Conservation initiatives conducted through the NRCS's SGI would have a greater direct impact towards ameliorating the threat on these lands. Since 2010, SGI has enhanced rangeland health through rotational grazing systems, re-vegetating former rangeland with sagebrush and perennial grasses and control of invasive weeds. On privately-owned lands, SGI has developed a prescribed grazing approach that balances forage availability with livestock demand. This system allows for adjustments to timing, frequency, and duration of grazing, ensuring rangelands are managed sustainably to provide continued ecological function of sagebrush-steppe. A primary focus of the prescribed grazing approach is maintenance of key plant species, such as deep-rooted perennial grasses that have been shown to be essential for ecological resistance to invasive annual grasses (Reisner et al. 2013, pp. 1047-1048). These actions help to alleviate the adverse impacts associated with historic improper grazing practices outlined above under *Nature and Type of Effects*. Within MZ I, SGI has implemented 1,370,300 acres of prescribed grazing systems. This program is likely the largest and most impactful program on private lands within MZ I. Because of its focus on priority areas for conservation, which often overlap PHMA, the SGI's past, present, and reasonably foreseeable work has had and likely will continue to have a cumulative beneficial impact on Greater Sage-Grouse when considered alongside protective BLM/Forest Service management actions in PHMA.

CCAAs are another tool being implemented to protect private lands from the threat of improper grazing. CCAAs are voluntary conservation agreements between the USFWS and one or more federal or private partners (e.g., the BLM). In return for managing lands to benefit Greater Sage-Grouse, landowners receive assurances against additional regulatory requirements should Greater Sage-Grouse be listed under the ESA. Within Wyoming, the USFWS and Wyoming Governor's Office in conjunction with the BLM, NRCS, Forest Service, and other agencies, have developed an umbrella CCAAs for range management activities. Enrolled landowners are expected to comply with grazing specific conservation measures including but not limited to: avoid (or rotationally utilize) known nesting and brood-rearing habitat as a location for activities that concentrate livestock such as stock tank placement branding and roundup; place salt or mineral supplements in sites minimizing impacts to Greater Sage-Grouse habitat; and within 24 months develop

and implement a written grazing management plan to maintain or enhance the existing plant community as suitable Greater Sage-Grouse habitat (USFWS 2013).

Together with the NRCS actions under the SGI (including fence marking and conservation easements), CCAAs, and state efforts to maintain ranchland, and the incremental effect of BLM and Forest Service grazing management actions would be a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I. This gain would be most pronounced under the Proposed LUP Amendments and Alternatives B and D because Greater Sage-Grouse specific conservation measures would be incorporated into grazing management practices without exerting pressure on non-BLM-administered lands and non-National Forest System lands.

Spread of Weeds

Nature and Type of Effects. Although cheatgrass does occur, past fire history and research has repeatedly demonstrated a healthy northern mixed-grass prairie plant community is resilient to cheatgrass expansion. Haferkamp (2001) studying annual bromes, including cheatgrass in eastern Montana, concluded there would be no ecological shift of northern mixed-grass prairies toward annual grass dominance. Instead, he concluded the amount and abundance of annual bromes occurring on Northern Great Plains rangeland is cyclic, depending on seedbank, temperature, amount, and distribution of precipitation. Expansion of annual bromes in mixed–grass prairie communities is buffered by two long-lived perennial grasses (western wheatgrass and blue grama), where grazing management maintains healthy native mixed-grass prairie vegetation (Haferkamp 2001). Vermiere et al. (2011) studied effects of fire on perennial and annual grasses (including cheatgrass) and found increased production of western wheatgrass and decreased annual grass production following summer fire in the northern mixed-grass prairie. Climate change research also suggests there would not be a cheatgrass invasion into the Northern Great Plains. Modeling illustrates the median precipitation change scenario (used to identify the most likely future climate change) depicts no increase in cheatgrass climatic habitat within the planning area (Bradley 2009).

Conditions in MZ I. By means of seeds carried by wind, humans, machinery, and animals, invasive and noxious weeds have invaded and will continue to invade many locations in MZ I, including the planning area.

The BLM and Forest Service currently manage weed infestations through integrated weed management, including biological, chemical, mechanical, manual, and educational methods. Weed management on BLM-administered lands is guided by the 1991 and 2007 RODs for Vegetation Treatment on BLM Lands in Thirteen Western States (BLM 1991) and by the 2007 Programmatic Environmental Report (BLM 2007). Weeds are managed in cooperation with county governments and represent a landscape-level approach across management jurisdictions.

Impact Analysis. Increased surface disturbance, motorized transportation, and animal and human activity would increase the chance for invasive plants to establish and spread.

The BLM and Forest Service manage weed infestations through integrated weed management practices, which include biological, chemical, mechanical, manual, and educational methods. This general approach for combating infestations will continue under all alternatives and the Proposed LUP Amendments. Increased activity (e.g., surface disturbance, motorized transportation, and animal or human activity) would increase the likelihood for the spread and establishment of invasive plants, regardless or surface land ownership. Management under Alternatives A and D would allow for the most acres of surface disturbance within Greater Sage-Grouse habitat in MZ I; therefore, the potential for invasive weed spread and establishment would be greatest under these alternatives, and effects to Greater Sage-Grouse (e.g. reduction in quality of habitat) would be more pronounced. Alternatives B, C, and the Proposed LUP Amendments

would place more restrictions on resource uses within Greater Sage-Grouse habitat on federal land when compared to Alternatives A and D. Therefore, fewer disturbances associated with resource uses are likely to occur under these alternatives, which would reduce the potential for invasive weed spread and establishment.

Relevant cumulative actions that result in surface-disturbing activities would increase the potential for the spread of invasive weeds on federal and non-federal lands. Projects subject to the general stipulations outlined in the Wyoming and Montana executive orders are required to control noxious and invasive weed species and to use native seed mixes during reclamation processes. These stipulations would benefit Greater Sage-Grouse habitat by limiting the spread or establishment of invasive species, particularly when applied on large blocks of land or on lands adjacent to BLM-administered lands or National Forest System lands where similar measures are required. These strategies in combination with state and county noxious weed regulations, continued integrated weed management practices, and other past, present and reasonably foreseeable future actions would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I under the Proposed LUP Amendments and other action alternatives by restoring degraded sagebrush habitat and increasing native forbs, thus improving nest cover and food supply. However, complete weed eradication within MZ I is not anticipated under any alternative or the Proposed LUP Amendments because of the scale and scope of efforts needed for complete eradication.

Conversion to Agriculture

Nature and Type of Effects. Converting sagebrush habitat to agricultural use causes direct loss of habitat available for Greater Sage-Grouse. Habitat loss also decreases the connectivity between seasonal habitats, increasing population isolation and fragmentation. Fragmentation then increases the probability of population decline, reduced genetic diversity, and extirpation from stochastic events (Knick and Hanser 2011).

In addition to reducing the land area available to support Greater Sage-Grouse, habitat loss and fragmentation is likely to exacerbate the effects of other naturally occurring and anthropogenic disturbances and could directly and indirectly increase the likelihood of certain disturbances on the landscape.

Conversion of native habitat to cropland has eliminated or fragmented sagebrush on private lands in areas with deep fertile soils or irrigation potential. Sagebrush remaining in these areas has been limited to the agricultural edge or to relatively unproductive environments that are ill-suited to sustaining leks, although may be beneficial for brood-rearing Greater Sage-Grouse depending upon the particular crop.

Biofuel production and small grain prices have increased the conversion to cropland of native grasslands or lands formerly enrolled in the US Department of Agriculture's Conservation Reserve Program. This conversion of private lands further emphasizes the cumulative importance of BLM-administered lands and National Forest System lands and associated private grazing lands in maintaining large blocks of native grassland and shrubland habitats suitable for Greater Sage-Grouse.

Conditions in MZ I. Across the Great Plains nearly 60% of native habitats have been lost to agricultural conversion (Samson et al. 2004) and conversion of sagebrush habitats is the most pervasive and extensive change to the sagebrush ecosystems in MZ I. Cropland currently covers nearly 19% of MZ I and influences approximately 50 to 80% of sagebrush in MZ I (Knick et al. 2011).

Regional assessments estimate that 7.2% of priority and general habitat in MZ I are directly influenced by agricultural development. These same assessments estimate that over 99% of priority habitat and general habitat in MZ I are within approximately 4 miles of agricultural land (Manier et al. 2013). Much of the direct habitat loss from conversion to agriculture has occurred in the northwestern and northeastern portions of MZ I, in Montana and the Dakotas (Knick et al. 2011).

Impact Analysis. As shown below in Table 4-119, Acres Identified for Retention and Disposal in Greater Sage-Grouse Habitat in MZ I, these acreages vary little in the planning area or in MZ I among the alternatives.

Table 4-119. Acres Identified for Retention and Disposal in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Acres Identified for Retention				
Alternative A	3,506,000	19%	3,329,000	21%
Alternative B	3,522,000	20%	3,329,000	21%
Alternative C	3,522,000	20%	3,329,000	21%
Alternative D	3,522,000	20%	3,329,000	21%
Proposed LUP Amendments	3,572,000	21%	3,279,000	20%
Acres Identified for Disposal				
Alternative A	16,000	100%	165,000	47%
Alternative B	0	0%	165,000	47%
Alternative C	0	0%	165,000	47%
Alternative D	0	0%	165,000	47%
Proposed LUP Amendments	0	0%	165,000	47%

Source: BLM 2015
This table displays the acres of PHMA and GHMA identified for retention and disposal in MZ I; it also displays the percentage of those acres that are found within the planning area.

BLM and Forest Service land tenure adjustments require site-specific NEPA analysis, and land sales must meet specific disposal criteria. Lands identified for disposal in MZ I are typically small isolated parcels that are difficult to manage and do not have high resource value. BLM and Forest Service land tenure adjustments are not anticipated to be a significant contributing element to the threat of agricultural conversion because of the small number of acres involved and the criteria in place that would reduce the likelihood of disposing of parcels containing significant wildlife value, (such as those lands containing leks, early brood rearing habitat, or winter habitat). As a result, cumulative impacts would vary relatively little across alternatives and BLM/Forest Service management would have little impact on alleviating this threat.

Studies of agricultural conversion risk on grasslands have shown a high probability of grassland plots being converted to cropland under current economic and climatic conditions (Rashford et al. 2013). The recent federal Farm Bill tried to discourage converting prairie to cropland by denying crop insurance for such conversions. Nevertheless, if corn and other crop prices remain high, the economic incentive to convert parcels to cropland in Greater Sage-Grouse habitat areas will continue and will potentially increase.

The COT Report objectives for converting land to agriculture are to avoid further loss of sagebrush habitat for agricultural activities (both plant and animal production) and to prioritize restoration. In areas where taking agricultural lands out of production has benefited Greater Sage-Grouse, the programs supporting

these actions should be targeted and continued (USFWS 2013). In accordance with this objective, the NRCS's SGI program focuses on maintaining ranchland that provides habitat for Greater Sage-Grouse.

This voluntary program provides private landowners with monetary incentives to protect Greater Sage-Grouse habitat, often through conservation easements. As a result, private land containing Greater Sage-Grouse habitat is protected from conversion to agriculture or other development for the life of the conservation agreement. The conservation easements and other conservation incentives, such as restoration of water features and fence marking, can enhance the ability of private ranchlands to support Greater Sage-Grouse. As of 2015, SGI has secured conservation easements on 65,900 acres within MZ I, and marked or removed 112 miles of fence (NRCS 2015). This has preserved habitat and reduced the risk of direct mortality on these lands.

These efforts, in conjunction with BLM and Forest Service management, would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I, but its impact would be localized and not likely to ameliorate the threat because of limited management authority.

Fire

Nature and Type of Effects. Sagebrush killed by wildfire often requires many years to recover, especially after large fires. Contiguous old-growth sagebrush sites are at high fire risk, as are large blocks of contiguous dead sagebrush and sagebrush sites with a substantial cheatgrass understory. Before recovering, these sites are of limited use to Greater Sage-Grouse, except along the edges and in unburned islands.

Because of its widespread impact on habitat, fire has been identified as a primary factor associated with Greater Sage-Grouse population declines. Depending on the species of sagebrush and the size of a burn, a return to a full pre-burn community cover can take from 25 to 120 years (Baker 2011). In addition, fires can reduce invertebrate food sources and may facilitate the spread of invasive weeds.

While most sagebrush subspecies are killed by fire and slow to reestablish, cheatgrass recovers within one to two years of a fire from seed in the soil. This annual recovery leads to a reoccurring fire cycle that prevents sagebrush reestablishment (USFWS 2010, p. 13932).

BLM and Forest Service management to prevent or control wildfires can also affect Greater Sage-Grouse and habitat. Increased human activity and noise associated with fire suppression, fuels treatments, and prescribed fire in areas occupied by Greater Sage-Grouse could affect nesting, breeding, and foraging behavior. Important habitats could be altered because of the use of heavy equipment, hand tools, and noise.

In addition, suppression may initially result in higher rates of conifer encroachment in some areas. In the initial stages of encroachment, fuel loadings remain consistent with the sagebrush understory. As conifer encroachment advances, fire return intervals are altered by decreasing understory abundance. The depleted understory causes the stands to become resistant to low intensity wildfires; over years, the accumulating conifer loads contribute to larger-scale wildfires and confound control efforts due to extreme fire behavior.

Conditions in MZ I. Fire risk is generally low across MZ I, with 17% of priority and general habitat having high risk for fire; however, isolated areas, especially in central Montana, South Dakota, the border between Montana and Wyoming, and eastern Wyoming are identified as having high fire risk. The risk of fire across other parts of this region needs better documentation (Manier et al. 2013).

Impact Analysis. BLM/Forest Service management in MZ I that addresses Greater Sage-Grouse habitat needs during wildfire response and prescribed burns would benefit the species by limiting habitat loss in the event of a wildfire or reducing potential impacts associated with prescribed burning. Under all action alternatives and the Proposed LUP Amendments, BLM and Forest Service planning units (i.e., Field

Offices, Ranger Districts, and National Forests), in coordination with USFWS and relevant state agencies would complete and continue to update Greater Sage-Grouse Landscapes Wildfire and Invasive Species Habitat Assessments to prioritize at-risk habitats, and identify fuels management, preparedness, suppression and restoration priorities necessary to maintain sagebrush habitat to support interconnecting Greater Sage-Grouse populations. In addition, all action alternatives and the Proposed LUP Amendments would implement a coordinated inter-agency approach to fire restrictions based upon National Fire Danger Rating System thresholds (fuel conditions, drought conditions, and predicted weather patterns) for Greater Sage-Grouse habitat. Alternative A does not include these measures during wildfire response and prescribed burning; therefore, Alternative A would afford less protection to Greater Sage-Grouse habitats and populations compared to Alternatives B, C, D, and the Proposed LUP Amendments.

Under Alternative C, fuels treatments would be designed and implemented to protect sagebrush systems in PHMA and GHMA. Under Alternative B and the Proposed LUP Amendments, fuels treatments would be designed and implemented to protect sagebrush systems in priority habitats only. Under Alternatives A and D, Fuels treatments would not be designed and implemented to specifically protect sagebrush systems in PHMA and GHMA. As such, Alternative C would afford the greatest protection of Greater Sage-Grouse habitat from fuels treatments while Alternatives A and D would afford the less protection.

The Wyoming and Montana executive orders emphasize fire suppression in Core Population Areas, while recognizing other suppression priorities may take precedence. This would benefit Greater Sage-Grouse habitat during wildfire planning and response, particularly on lands not administered by the BLM or Forest Service.

WAFWA's guidance on fire and fuels management for Greater Sage-Grouse conservation (WAFWA 2014) promotes coordination among local fire response agencies similar to a "natural disaster" response; it emphasizes the importance of fuel breaks and the need to incorporate Greater Sage-Grouse habitat objectives in fire management, as well as the use of grazing as a fuel reduction tool.

On the local level, the Northeast Wyoming Sage-Grouse Conservation Plan (2014) recommends coordinating with county fire agencies and landowners to develop and implement wildfire suppression guidelines that address Greater Sage-Grouse habitat health and management. Other LWGs in MZ I include similar recommendations.

Recognition of important of sagebrush habitat during interagency wildfire response would benefit the Greater Sage-Grouse in the event of an unplanned fire. The Interagency Standards for Fire and Fire Aviation Operations "Red Book" includes a BMP for Greater Sage-Grouse habitat conservation for wildland fire and fuels management (BLM 2013). This document serves as supplemental policy or guidance for the BLM, Forest Service, and USFWS. This BMP would benefit the Greater Sage-Grouse (particularly during interagency wildland fire operations) by utilizing spatial habitat data and using predictive services to prioritize and preposition firefighting resources in critical habitat areas. The coordination of federal, state, and local fire prevention actions, changes in fire management, and other past, present, and reasonably foreseeable future actions would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I. This is in accordance with the COT report objective to retain and restore healthy native sagebrush plant communities within the range of Greater Sage-Grouse (USFWS 2013). The gain would be greatest under Alternatives B, C, D, and the Proposed LUP Amendments because of the management actions which emphasize preserving Greater Sage-Grouse habitat and minimizing damage associated with fire.

Recreation

Nature and Type of Effects. Recreation, such as camping, bicycling, wildlife viewing, horseback riding, fishing, and hunting, can be dispersed; concentrated, such OHV use and developed campsites; and permitted, such as via BLM SRPs and Forest Service SUPs. The BLM also manages SRMAs where recreation is a primary resource management consideration.

Recreation on BLM-administered and National Forest System lands that use the extensive network of single- and double-track routes impact sagebrush and Greater Sage-Grouse. Ecological impacts of roads and motorized trails include mortality due to collisions; behavior modifications due to noise, activity, and habitat loss; alteration of physical environment; nutrient leaching; erosion; invasive plants spread; increased use; and alteration by humans due to accessibility (Knick et al. 2011). Recreation activities can degrade Greater Sage-Grouse habitat through direct impacts on vegetation and soils, introduction or spread of invasive species, and habitat fragmentation. This occurs in areas of concentrated use, trailheads, staging areas, and routes and trails.

Motorized activities, including OHV use, are expected to have a larger footprint on the landscape. They are anticipated to have the greatest level of impact due to noise levels, compared to nonmotorized uses, such as hiking or equestrian use. Cross-country motorized travel, which is permitted in designated areas on BLM-administered lands but not on National Forest System lands, would increase the potential for soil compaction, perennial grasses and forbs loss, and reduce sagebrush canopy cover. Losses in sagebrush canopy could be the result of repeated, high-frequency, cross-country OHV use over long periods. In addition, the chances of wildfire are increased during the summer, when fire dangers are high and recreation is at its highest.

Dispersed uses expand the human footprint. Closing areas to recreation and reclaiming unused, minimally used, or redundant roads in and around sagebrush habitats during seasonal use by Greater Sage-Grouse may reduce the footprint and presumably impacts on wildlife. Restricting access to important habitat areas during seasonal use (lekking, nesting, brood-rearing, and wintering) may decrease the impacts associated with humans. However, access restriction will not eliminate other impacts, such as invasive plant spread, predator movements, cover loss, and erosion (Manier et al. 2013).

Conditions in MZ I. Historically low in the Great Plains, human population densities have increased 666% since 1920 (Knick et al. 2011). With expanding population comes greater human impacts (Leu et al. 2008), with many people moving to the Great Plains region because of access to public lands (Hansen et al. 2005).

Within the planning area, most recreation is dispersed, although developed recreation sites are also widespread. Networks of roads and trails on all types of land ownership are common within the planning area and MZ I; many of these routes are accessible by OHVs and provide access for non-motorized recreational activities such as hiking, fishing, and hunting.

The COT Report objectives for recreation are to maintain healthy native sagebrush communities, based on local ecological conditions, and to manage direct and indirect human disturbance (including noise) to avoid interruption of normal Greater Sage-Grouse behavior (USFWS 2013). Limits on road use under the action alternatives and limits on OHVs would help meet these objectives.

Impact Analysis. Table 4-120 shows Acres of Travel Management Designations in Greater Sage-Grouse Habitat in MZ I.

Table 4-120. Acres of Travel Management Designations in Greater Sage-Grouse Habitat in MZ I

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ I	Percent Within Planning Area	MZ I	Percent Within Planning Area
Open				
Alternative A	0	0%	0	0%
Alternative B	0	0%	0	0%
Alternative C	0	0%	0	0%
Alternative D	0	0%	0	0%
Proposed LUP Amendments	0	0%	0	0%
Limited				
Alternative A	3,513,000	19%	3,444,000	22%
Alternative B	3,513,000	19%	3,444,000	22%
Alternative C	3,513,000	19%	3,444,000	22%
Alternative D	3,513,000	19%	3,444,000	22%
Proposed LUP Amendments	3,563,000	21%	3,394,000	21%
Closed				
Alternative A	5,000	80%	40,000	13%
Alternative B	5,000	80%	40,000	13%
Alternative C	5,000	80%	40,000	13%
Alternative D	5,000	80%	40,000	13%
Proposed LUP Amendments	5,000	80%	40,000	13%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within travel management designations of open, limited, and closed in MZ I; it also displays the percentage of those acres that are found within the planning area.

The COT Report objectives for recreation are to maintain healthy native sagebrush communities, based on local ecological conditions, and to manage direct and indirect human disturbance (including noise) to avoid interruption of normal Greater Sage-Grouse behavior (USFWS 2013). Limits on road use under the action alternatives and Proposed LUP Amendments, as well as restrictions for OHVs would help meet these objectives.

As shown in Table 4-120, travel management designations in PHMA and GHMA have little variance between alternatives, and no notable differences are anticipated in cumulative impacts across the action alternatives. No PHMA or GHMA would be designated as open to cross country travel in MZ I under any of the alternatives or the Proposed LUP Amendments. 5,000 acres of PHMA and 40,000 acres of GHMA would be designated as closed. The majority of Greater Sage-Grouse habitat would be designated as limited to existing routes. As such, OHVs would be prohibited from traveling off existing routes, which would reduce the risk of direct and indirect effects from recreation motorized vehicles. On existing routes which travel through PHMA and GHMA, noise disturbance or direct mortality through collision may occur. Seasonal road closures identified during the travel management process would help to reduce this impact.

Additionally, the anthropogenic disturbance cap restrictions under the all action alternatives would limit new road construction in Greater Sage-Grouse habitat. The absence of this cap in the No Action alternative would result in greater impacts on Greater Sage-Grouse in the Greater Sage-Grouse LUP Amendment planning area because additional roads could be constructed, leading to increased fragmentation and vehicle collisions.

LWGs in MZ I may also help reduce the threat of recreation. For example, the Northeast Wyoming Greater Sage-Grouse Conservation Plan (Northeast Wyoming Sage-Grouse Working Group 2014) identifies recommendations for reducing impacts associated with recreation. These recommendations include but are not limited to: discouraging dispersed camping within important riparian habitats occupied by Greater Sage-Grouse during late summer, avoiding recreational activities in Greater Sage-Grouse nesting habitat during the nesting season, and developing and providing information related to recreation and its impacts on Greater Sage-Grouse habitat. Other LWGs within MZ I include similar recommendations in their conservation plans. These actions could help ameliorate the threat on non-federal lands.

Implementation of any action alternatives or the Proposed LUP Amendments as described above, in concert with travel management planning on BLM-administered lands and National Forest System lands within MZ I, the disturbance caps applied under the state plans, and other past, present, and reasonably foreseeable future actions would help reduce the threat of recreation and travel on Greater Sage-Grouse populations and habitats and would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ I.

4.23.7 Threats to Greater Sage-Grouse in Management Zone II/VII

The COT Report identifies the present and widespread threats facing Greater Sage-Grouse in MZ II/VII as energy development, infrastructure, grazing/free-roaming equids, conversion to agriculture and urbanization, fire, spread of weeds, recreation, and conifers (USFWS 2013). These threats impact Greater Sage-Grouse mainly by fragmenting and degrading their habitat. The loss of sagebrush steppe across the west approaches or exceeds 50% in some areas. Habitat fragmentation and degradation is a primary factor in long-term declines in Greater Sage-Grouse abundance across their historical range (USFWS 2010).

Habitat fragmentation reduces connectivity of populations and increases the likelihood of extirpation from random events, such as drought or outbreak of West Nile virus. Furthermore, climate change is likely to affect habitat availability to some degree, by decreasing summer flows and limiting growth of grasses and forbs, thereby limiting water and food supply (BLM 2012). Sensitive species such as Greater Sage-Grouse, which are already stressed by declining habitat, increased development, and other factors, could experience additional pressures as a result of climate change.

Each COT Report threat considered present and widespread in at least one population in MZ II/VII is discussed below.

Energy Development and Mining

The COT Report states that energy development should be designed to ensure that it will not impinge on stable or increasing Greater Sage-Grouse population trends. For mining, the objective is to maintain stable to increasing Greater Sage-Grouse populations and no net loss of Greater Sage-Grouse habitats in areas affected by mining (USFWS 2013).

There are approximately 1,144,800 acres of Greater Sage-Grouse habitat in MZ II/VII where energy development is presently occurring, and over 30,000,000 acres are indirectly influenced by energy development, including oil and gas, coal leasing, mineral materials, and renewables (Manier et al. 2013, pp.55-71). Indirect influences are largely due to oil and gas leases.

Oil and Gas

Nature and Type of Effects. The nature and type of effects associated with oil and gas development is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. Oil and natural gas development-related wells indirectly influence 78 to 84% of priority habitat and general habitat respectively across MZ II/VII. BLM-administered lands account for 54% of wells in priority habitat (and 50% in general habitat) within MZ II/VII (Manier et al. 2013). Therefore, BLM actions are likely to have a greater potential to ameliorate the effects of oil and gas development on Greater Sage-Grouse habitat than any other single land management entity.

The Greater Green River area of southwest Wyoming and the Uintah– Piceance basin are important reserves of oil and gas in MZ II/VII, along with oil shale and tar sands. The Uintah–Piceance geologic basin includes the Colorado Plateau and overlaps into the southern edge of the Wyoming Basin. Greater Sage-Grouse in this part of the range have been reduced to four small, isolated populations (USFWS 2013).

Though the BLM and Forest Service may restrict future leasing for oil and gas on BLM-administered and National Forest System lands within Greater Sage-Grouse habitat, existing leases remain valid with potential for development based on locations of geologic fields for traditional oil and gas distributed extensively across eastern portions of Greater Sage-Grouse range (Manier et al. 2013). The Southwestern Wyoming and the Uinta–Piceance geological basins are both located partly in MZ II/VII, and coincide with high-density areas of Greater Sage-Grouse, large numbers of leks, and the highest male attendance at leks compared with any areas in the eastern part of the range (USFWS 2010).

The Pinedale Anticline Project (a natural gas field) is in the Greater Green River area of the Southwest Wyoming Basin where the Greater Sage-Grouse subpopulation in southwestern Wyoming and northwestern Colorado has some of the highest estimated densities of males anywhere in the remaining range of the species (Connelly *et al*. 2004, pp. 6-62). The southwestern Wyoming and northwestern Colorado subpopulation has historically supported more than 800 leks (Connelly *et al*. 2004, p. 6-62). The Southwestern Wyoming geological basin, a stronghold for Greater Sage-Grouse, also is experiencing significant growth in energy development (USFWS 2010).

Oil and gas conservation measures across MZ II/VII are more widespread than in the past. Much oil and gas development on private lands previously occurred with minimal mitigation efforts, but restrictions are now in place to protect Greater Sage-Grouse habitat under the Wyoming and Montana Executive Orders. Additionally, in Colorado, operators may be subject to consultation requirements under the Colorado Oil and Gas Conservation Commission rules, to determine if COAs are necessary to minimize adverse impacts from proposed oil and gas operations in sensitive wildlife habitat (such as Greater Sage-Grouse PHMA).

Impact Analysis. Table 4-121 and Table 4-122 provide a quantitative summary of fluid mineral leasing conditions on BLM-administered and National Forest System lands across MZ II/VII, followed by an analysis of the Greater Sage-Grouse LUP Amendments alternatives.

Table 4-121. Acres Open* and Closed to Fluid Mineral Leasing in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Open* to Fluid Mineral Leasing				
Alternative A	635,000	100%	2,509,000	53%

	Priority Habitat Management Areas		General Habitat Management Areas	
Alternative B	0	0%	2,509,000	53%
Alternative C	0	0%	1,176,000	0%
Alternative D	629,000	100%	2,509,000	53%
Proposed LUP Amendments	0	0%	2,378,000	51%
Closed to Fluid Mineral Leasing				
Alternative A	1,267,000	68%	1,187,000	61%
Alternative B	5,825,000	93%	1,187,000	61%
Alternative C	5,825,000	93%	7,184,000	94%
Alternative D	1,321,000	70%	1,187,000	61%
Proposed LUP Amendments	1,290,000	69%	1,165,000	61%

Source: BLM 2015
*Open with standard lease terms and conditions. This table displays the acres of PHMA and GHMA open and closed to fluid mineral leasing in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

Table 4-122. Acres with NSO and CSU/TL Stipulations in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
NSO Stipulations				
Alternative A	4,419,000	15%	1,288,000	32%
Alternative B	3,742,000	0%	1,288,000	32%
Alternative C	3,742,000	0%	874,000	0%
Alternative D	4,396,000	15%	1,288,000	32%
Proposed LUP Amendments	4,442,000	16%	1,281,000	32%
CSU/TL Stipulations				
Alternative A	4,722,000	69%	6,869,000	62%
Alternative B	1,482,000	0%	6,869,000	62%
Alternative C	1,482,000	0%	2,636,000	0%
Alternative D	4,697,000	68%	6,896,000	62%
Proposed LUP Amendments	5,407,000	73%	6,957,000	62%

Source: BLM 2015
This table displays the acres of PHMA and GHMA with NSO Stipulations and CSU/TL Stipulations in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

As shown in Table 4-121, fluid mineral closures within the Greater Sage-Grouse LUP Amendment planning area exert a relatively large influence when compared to the broader MZ. Under all alternatives and the

Proposed LUP Amendments, the majority of PHMA and GHMA closures occur within the planning area. As such, BLM and Forest Service management actions specific to the planning area (i.e., closures and stipulations in PHMA and GHMA) will affect the threat amelioration within the larger MZ.

Under Alternative A, 635,000 acres of PHMA in MZ II/VII would be open to fluid mineral leasing under standard lease terms and conditions (all of which would be located in the Greater Sage-Grouse LUP Amendment planning area. Additionally 2,509,000 acres of GHMA would be open to leasing in the MZ. The lack of protective restrictions in these areas would increase the potential for harm or disturbance associated with new leasing projects. Greater Sage-Grouse would be most vulnerable to disturbance from oil and gas leasing and development in the Greater Sage-Grouse LUP Amendment planning area; implementing other BLM/Forest Service Proposed LUPs throughout the remainder of the MZ would result in greater long-term protections on BLM-administered lands and National Forest System lands in those areas. Conservation actions at the state and local level (e.g., state Greater Sage-Grouse plans and conservation easements) would complement other BLM/Forest Service Proposed LUPs while oil and gas-related past, present, and reasonably foreseeable future actions that cause surface disturbance would result in a continued threat to Greater Sage-Grouse, specifically within the planning area.

Acres of PHMA and GHMA closed to fluid mineral leasing in MZ II/VII would be greatest under Alternatives B and C. 5,825,000 acres of PHMA would be closed to fluid mineral leasing under both alternatives, which accounts for approximately 41% of all PHMA in the MZ. As such, reasonably foreseeable future leasing projects would be less likely to impact Greater Sage-Grouse populations on federal lands. The risk of habitat fragmentation or disturbance due to new oil and gas development would be reduced. The incremental effect of implementing Alternatives B or C in conjunction with BLM/Forest Service Proposed LUPs elsewhere in the MZ and the past, present, and reasonably foreseeable future actions disclosed in Table 4-109 and Table 4-132 would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII on BLM and National Forest System lands because these two alternatives are the most restrictive for oil and gas development. However, the extensive fluid mineral closures under these alternatives could push development onto adjacent non-federal lands with less restrictive management.

Acres of PHMA and GHMA open to fluid mineral leasing under standards terms and conditions would be approximately the same under Alternative D as Alternative A. The lack of protective restrictions in these areas would increase the potential for harm or disturbance associated with new leasing projects.

Under the Proposed LUP Amendments, no PHMA and approximately 2,378,000 acres of GHMA would be open to fluid mineral leasing in MZ II/VII (under standard lease terms and conditions). Applying major or moderate stipulations in MZ II/VII would benefit Greater Sage-Grouse by limiting new development in important habitat areas. While new oil and gas development is likely to occur on lands not administered by the BLM or Forest Service, such projects may be subject to the requirements of the Wyoming executive order and other state conservation plans, which would limit disturbance. For areas already leased for oil and gas but not yet developed, operators may be subject to COAs. COAs are enforceable conditions or provision under which an APD is approved. Specific COAs are included in each individual BLM/Forest Service LUP within MZ II/VII. Timing limitations specific to the LUP Amendment planning area would help to protect breeding, nesting, and early brood rearing habitats, and contribute to the MZ-wide protection of the Greater Sage-Grouse. For example, in Core Population Areas, surface disturbing and/or disruptive activities would be prohibited between March 15 through June 30; in connectivity areas within PHMAs, surface disturbing and/or disruptive activities would be prohibited within 4 miles of the lek or lek perimeter within the same timeframe. Timing limitations would also apply to leks located outside of PHMAs, within a 2-mile buffer. Additionally, approximately 95,200 acres of habitat managed as GHMA in Alternatives A through D would be managed as PHMA on the BTNF under the Proposed LUP Amendments. The incremental effects of implementing the Proposed LUP Amendments in conjunction with other Greater

Sage-Grouse conservation plans in MZ II/VII would result in a net conservation gain for Greater Sage-Grouse because of the additional restrictions in important habitat areas, and the additional acres of habitat managed as PHMA compared to all other alternatives.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming executive orders) could be synergistic. For example, applying buffers in PHMA and on state and private land would effectively conserve larger blocks of land than if these actions occurred individually. This would provide a landscape-scale net conservation benefit, especially in areas where little development has occurred to date.

All BLM/Forest Service Proposed LUPs within MZ II/VII include BMPs and RDFs to minimize impacts on Greater Sage-Grouse from oil and gas development on BLM-administered lands and National Forest System lands. Examples include locating new compressor stations outside of PHMA to reduce noise disturbance, clustering operations and facilities as closely as possible, placing infrastructure in already disturbed locations where the habitat has not been fully restored, and restoring disturbed areas at final reclamation to the predisturbance landforms and desired plant communities. State plans contain similar measures to reduce impacts. Together, these measures would help protect unfragmented habitats, minimize habitat loss and fragmentation, and maintain conditions that meet Greater Sage-Grouse life history needs. Recent research (Arkle et al. 2014) indicates that restored habitats lack many of the features sought by Greater Sage-Grouse in their habitat areas and may not support Greater Sage-Grouse for long periods following restoration activities. In order to conserve Greater Sage-Grouse populations on the landscape, protection of existing habitat through minimizing development would provide the best hope for Greater Sage-Grouse persistence (Arkle et al. 2014).

Implementation of the Proposed LUP Amendments, in combination with other BLM/Forest Service planning efforts within MZ II/VII, could affect proposed oil and gas development projects. Large-scale oil and gas projects that could potentially occur on Greater Sage-Grouse habitat within MZ II/VII (such as the Hiawatha Regional Energy Development EIS, LaBarge Platform Exploration and Development Project, and Continental Divide-Creston Natural Gas Project, as discussed in Tables 4-109 and 4-132) would be subject to the disturbance cap limitations of the Wyoming executive order and/or other BLM/Forest Service Proposed LUPs. Additionally, these projects may be subject to NSO and CSU/TL stipulations where proposed development occurs on BLM-administered or National Forest System lands within Greater Sage-Grouse habitat. Reasonably foreseeable future projects are likely to affect Greater Sage-Grouse and sagebrush habitats, but mitigation requirements in BLM/Forest Service LUPs and state and other Greater Sage-Grouse conservation plans would offset disturbances from future projects and result in a net conservation gain for Greater Sage-Grouse.

Implementing any alternative under the Greater Sage-Grouse LUP Amendments would not affect pending or future oil and gas development projects outside of the planning area. Other BLM/Forest Service LUPs and non-federal actions would have a greater impact on ameliorating the threat of oil and gas development in these areas. Given the extent of oil and gas resources present in MZ II/VII, development pressure is likely to continue. While applying stipulations and closing areas to leasing would minimize impacts on federal mineral estate, restrictions on oil and gas development on non-federal lands are less stringent. in Colorado, operators may be subject to consultation requirements under the Colorado Oil and Gas Conservation Commission rules to determine if COAs are necessary to minimize adverse impacts from proposed oil and gas operations in sensitive wildlife habitat (such as Greater Sage-Grouse PHMA). In Wyoming, the disturbance cap limitations of the executive order would help to limit cumulative impacts associated with oil and gas development on state lands.

Overall, under the Proposed LUP Amendments, the combination of past, present, and reasonably foreseeable future actions aimed at protecting Greater Sage-Grouse and their habitat would improve

baseline conditions and provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII. Reasonably foreseeable oil and gas development is widespread in the MZ. When the impacts of the LUP Amendment are added to these actions, the impact would be a net conservation gain due in large part to implementation of NSO stipulations, anthropogenic disturbance caps, and adaptive management that would minimize future disturbance to Greater Sage-Grouse populations and habitats.

Coal

Nature and Type of Effects. The nature and type of effects associated with coal development is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. Existing and proposed coal leases occur within the planning area and within the larger MZ. Coal surface leases indirectly influence 8 to 10% of priority habitat and general habitat respectively across MZ II/VII. Approximately 50% of coal leases in priority habitat (and 57% in general habitat) occur on private lands within MZ II/VII (Manier et al. 2013). Therefore, private actions are likely to have a greater potential to ameliorate the effects of coal development on Greater Sage-Grouse than any other single land management entity.

Impact Analysis. Coal development would continue on existing leases under all alternatives. Existing leases located within or in proximity to Greater Sage-Grouse habitat (including connectivity corridors) may continue to affect Greater Sage-Grouse through noise disturbance and vehicle collision risk. However, under all action alternatives and the Proposed LUP Amendments, all appropriate RDFs would be applied as mandatory Stipulations/COAs within PHMA for coal exploration. These measures would help to minimize surface disturbing activities and noise for coal exploration activities in PHMA, and would afford greater protection of Greater Sage-Grouse compared to Alternative A.

Under Alternatives B and C, no new underground mining leases would be granted unless all surface disturbances (appurtenant facilities) are placed outside of Greater Sage-Grouse PHMA. Where new appurtenant facilities associated with an existing lease cannot be located outside PHMA, new facilities would be co-located within existing disturbed areas. If this is not possible, any new appurtenant facilities would be constructed to the absolute minimum standard necessary. These measures would limit new disturbance associated with coal development in PHMA on BLM-administered and National Forest System lands.

Under the Proposed LUP Amendments, coal exploration activities could be allowed in PHMAs if they can be completed in compliance to surface occupancy and disturbance and density stipulations analyzed through the DDCT. This would help to maintain contiguous blocks of suitable habitat for Greater Sage-Grouse.

Under all alternatives and the Proposed LUP Amendments, new coal lease applications on federal mineral estate would be subject to suitability determinations governed by 43 CFR, Part 3461.5. Under unsuitability criterion 15, the BLM may determine that portions of the MZ contain essential Greater Sage-Grouse habitat and are unsuitable for all or certain stipulated methods of coal mining. If the BLM made this determination, it would apply stipulations to restrict coal mining and protect Greater Sage-Grouse, including possibly prohibiting surface coal mining. As such, the regulations under Criterion 15 of 43 CFR, Part 3461.5(o)(1) would reduce the potential for long-term impacts associated with new coal leasing projects on Greater Sage-Grouse habitats and populations.

New coal leasing and development may also occur on non-federal lands in MZ II/VII, subject to state regulations (include reclamation requirements). Additionally, new coal leasing in Wyoming and Montana would be subject to the surface disturbance limit as outlined in the Wyoming and Montana executive orders. These measures would help protect Greater Sage-Grouse habitat on lands where 43 CFR, Part 3461.5(o)(1) do not apply.

The regulatory requirements of 43 CFR, Part 3461.5, Criterion 15, in combination with BLM planning efforts and state plans, would help reduce the threat from coal extraction and would provide a net conservation gain to Greater Sage-Grouse in MZ II/VII.

Mineral Materials

Nature and Type of Effects. The nature and type of effects associated with mineral materials disposal is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. Mineral material disposal sites indirectly influence 11 to 17% of general habitat and priority habitat respectively across MZ II/VII. Approximately 65% of mineral material disposal sites in priority habitat (and 60% in general habitat) occur on BLM-administered lands within MZ II/VII (Manier et al. 2013). Therefore, BLM actions are likely to have a greater potential to ameliorate the effects of mineral material disposal on Greater Sage-Grouse than any other single land management entity. For example, closure of BLM-administered and/or National Forest System lands to mineral material disposal could shift a majority of mineral material disposal in the MZ onto adjacent lands.

Impact Analysis. Table 4-123, Acres Open and Closed to Mineral Material Disposal in Greater Sage-Grouse Habitat in MZ II/VII, shows acres of PHMA and GHMA open and closed to mineral material disposal by alternative.

Table 4-123. Acres Open and Closed to Mineral Material Disposal in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Open to Mineral Material Disposal				
Alternative A	7,053,000	68%	9,874,000	61%
Alternative B	2,244,000	0%	9,868,000	61%
Alternative C	2,244,000	0%	9,868,000	61%
Alternative D	7,053,000	68%	9,874,000	61%
Proposed LUP Amendments	7,181,000	69%	9,762,000	61%
Closed to Mineral Material Disposal				
Alternative A	3,538,000	16%	1,373,000	46%
Alternative B	8,345,000	64%	1,373,000	46%
Alternative C	8,345,000	64%	1,373,000	46%
Alternative D	3,538,000	16%	1,373,000	46%
Proposed LUP Amendments	3,495,000	15%	1,390,000	46%

Source: BLM 2015
This table displays the acres of PHMA and GHMA open and closed to mineral material disposal in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

Under Alternative A, 3,538,000 acres of PHMA are closed to mineral material disposal in MZ II/VII, and 1,373,000 acres of GHMA are closed. 7,053,000 acres of PHMA would remain open, as would 9,874,000 acres of GHMA. Reasonably foreseeable future mineral material disposals in MZ II/VII could affect Greater

Sage-Grouse through habitat disturbance, fragmentation, or behavior disruptions, depending on the location and extent of the project; however, implementation of BLM/Forest Service Proposed LUPs in other areas of MZ II/VII would restrict development, thereby reducing the risk of removing or fragmenting habitat, particularly on federal lands. There would be a net conservation to Greater Sage-Grouse habitats and populations in MZ II/VII, but it would be concentrated in areas outside the Greater Sage-Grouse LUP Amendment planning area.

Alternatives B and C would close the most acres of PHMA and GHMA to mineral material disposal. Both alternatives would close 8,345,000 acres of PHMA, which represents 59% of all PHMA in MZ II/VII. These closures would restrict new developments on Greater Sage-Grouse habitat on BLM-administered and National Forest System lands, thereby contributing to the protection of habitat. Designating Greater Sage-Grouse habitat as open or closed to mineral material disposal would not preclude existing facilities from continued operation. In areas where existing mineral material disposal sites affect Greater Sage-Grouse (e.g., through noise disturbance or vehicle collision risk), these impacts would likely continue.

Alternative D would close the same number of PHMA and GHMA acres to mineral material disposal as Alternative A. Cumulative effects would be similar between the two alternatives.

The Proposed LUP Amendments would close 3,495,000 acres of PHMA and 1,390,000 acres of GHMA to mineral material disposal in MZ II/VII. Acres of PHMA and GHMA designated as closed would be similar to Alternative A. On non-federal lands, the development limitations applied under the Wyoming executive order would reduce impacts to Greater Sage-Grouse habitat across the state and would encourage mineral material disposal in areas away from Core Population Areas. Reclamation provisions under all action alternatives and the Proposed LUP Amendments would help restore sagebrush habitat in mineral pits that are no longer in use.

Overall, the BLM and Forest Service management actions for mineral materials development in the Proposed LUP Amendments, combined with past, present, and reasonably foreseeable future actions, would preserve habitat and would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII.

Locatable Minerals

Nature and Type of Effects. The nature and type of effects associated with locatable mineral exploration is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. The primary locatable minerals in commercially viable quantities in the planning area and other parts of MZ II/VII are sodium bentonite, gypsum, and uranium.

Impact Analysis. Table 4-124, Acres Open and Recommended for Withdrawal from Mineral Entry in Greater Sage-Grouse Habitat in MZ II/VII, shows acres of PHMA and GHMA open and recommended for withdrawal within MZ II/VII and the percent of those acres occurring in the planning area.

Table 4-124. Acres Open and Recommended for Withdrawal from Mineral Entry in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Open to Mineral Entry				
Alternative A	8,387,000	43%	9,001,000	50%

	Priority Habitat Management Areas		General Habitat Management Areas	
Alternative B	4,819,000	0%	9,001,000	50%
Alternative C	4,819,000	0%	9,001,000	50%
Alternative D	8,387,000	43%	9,001,000	50%
Proposed LUP Amendments	8,190,000	41%	8,940,000	50%
Recommended for Withdrawal from Locatable Mineral Entry				
Alternative A	639,000	10%	235,000	24%
Alternative B	4,207,000	86%	235,000	24%
Alternative C	4,207,000	86%	235,000	24%
Alternative D	639,000	10%	235,000	24%
Proposed LUP Amendments	893,000	35%	235,000	24%

Source: BLM 2015
This table displays the acres of PHMA and GHMA open to mineral entry and recommended for withdrawal from locatable mineral entry in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

Under Alternatives A and D, 693,000 acres of PHMA and 235,000 acres of GHMA would be recommended for withdrawal from locatable mineral entry in MZ II/VII. Recommending withdrawal of Greater Sage-Grouse habitat from locatable mineral entry would restrict exploration or development of unclaimed lands, which would reduce the potential for impacts to sagebrush habitats. Existing claims in PHMA and GHMA would remain valid subject to existing rights determinations. If developed, these lands may result in impacts such as habitat disturbance and fragmentation.

Alternatives B and C would recommend substantially more acres of PHMA for withdrawal in MZ II/VII (4,207,000 acres, an increase of more than 550% compared to Alternatives A or D). The incremental effects of other regional efforts combined with implementation of Alternatives B and C would provide the greatest net conservation gain to Greater Sage-Grouse in MZ II/VII.

Under the Proposed LUP Amendments 893,000 acres of PHMA and 235,000 acres of GHMA would be recommended for withdraw from locatable mineral entry. This represents an increase in PHMA acres recommended for withdrawal when compared to Alternative A. As with all alternatives, existing claims in PHMA and GHMA would remain valid subject to existing rights determinations. If developed, these lands may result in impacts such as habitat disturbance and fragmentation.

Under all alternatives and the Proposed LUP Amendments, BMPs would help minimize impacts on Greater Sage-Grouse from locatable mineral development on BLM-administered and National Forest System lands. All BLM/Forest Service Proposed LUPs within MZ II/VII include BMPs, such as placing infrastructure in already disturbed locations where the habitat has not been fully restored, and restoring disturbed areas at final reclamation to the pre-disturbance landforms and desired plant communities.

Implementation of all other BLM/Forest Service Proposed LUPs in MZ II/VII would recommend portions of SFAs for mineral withdrawal. As such, implementation of any alternative or the Proposed LUP Amendments would result in a net conservation gain to Greater Sage-Grouse populations and habitat by reducing disturbance to birds from human activity and habitat fragmentation caused by mining activities.

Non-energy Leasable Minerals

Nature and Type of Effects. The nature and type of effects associated with non-energy leasing is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. In MZ II/VII, existing federal mineral prospecting permits for non-energy leasable resources have a direct footprint on 378,400 acres of priority habitat and 557,100 acres of general habitat (Manier et al. 2013, p. 79).

Impact Analysis. Table 4-125, Acres Open and Closed to Non-energy Leasable Mineral Leasing in Greater Sage-Grouse Habitat in MZ II/VII, shows the acres of PHMA and GHMA open and closed to non-energy leasing in MZ II/VII, and the percent of those acres occurring within the planning area.

Table 4-125. Acres Open and Closed to Non-energy Leasable Mineral Leasing in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Open to Non-energy Leasing				
Alternative A	5,855,000	83%	8,005,000	76%
Alternative B	982,000	0%	8,005,000	76%
Alternative C	982,000	0%	8,005,000	76%
Alternative D	5,855,000	83%	8,005,000	76%
Proposed LUP Amendments	5,921,000	83%	7,939,000	75%
Closed to Non-energy Leasing				
Alternative A	3,623,000	14%	1,136,000	55%
Alternative B	8,496,000	63%	1,136,000	55%
Alternative C	8,496,000	63%	1,136,000	55%
Alternative D	3,623,000	14%	1,136,000	55%
Proposed LUP Amendments	3,646,000	15%	1,114,000	54%

Source: BLM 2015
This table displays the acres of PHMA and GHMA open and closed to non-energy leasing in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

Acres of PHMA and GHMA closed to non-energy leasing in MZ II/VII would be similar between Alternatives A, D, and the Proposed LUP Amendments. The Proposed LUP Amendments would designate 23,000 additional acres of PHMA as closed to non-energy leasing compared to Alternative A. The majority of PHMA closures would be located outside of the Greater Sage-Grouse LUP Amendment planning area. In combination with the disturbance cap applied under state plans, BLM and Forest Service actions in other planning areas in MZ II/VII, and other past, present, and reasonably foreseeable future actions, the Proposed LUP Amendment would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII.

Alternatives B and C would be the most restrictive in terms of non-energy leasing closures on BLM-administered and National Forest System lands. Under both alternatives, 8,496,000 acres of PHMA (60%

of all PHMA in MZ II/VII) would be closed. Precluding non-energy leasable development in PHMA would reduce the potential for habitat disturbance and fragmentation, and behavioral disruptions. The incremental effects of implementing Alternatives B and C in combination with other regional efforts would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII.

Infrastructure

Rights-of-Way and Special Use Authorizations

Nature and Type of Effects. The nature and type of effects associated with ROW development is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. Infrastructure, such as ROWs and associated facilities and urbanization, is prevalent throughout MZ II/VII.

Although not representative of all infrastructure ROW, transmission lines (greater than 115 kilovolt) indirectly influence 60 to 63% of priority habitat and general habitat respectively across MZ II/VII. Approximately 50% of transmission lines in priority habitat (and 45% in general habitat) are located on BLM-administered lands across Greater Sage-Grouse habitats in MZ II/VII (Manier et al. 2013). Therefore, BLM actions are likely to have a greater potential to ameliorate the effects of transmission line ROW on Greater Sage-Grouse than any other single land management entity.

Impact Analysis. Table 4-126, Acres of ROW/SUA Management in Greater Sage-Grouse Habitat in MZ II/VII, lists the areas of ROW/SUA avoidance and exclusion in Greater Sage-Grouse habitat by alternative.

Table 4-126. Acres of Rights-of-Way/Special Use Authorization Management in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Open to Rights-of-Way/Special Use Authorization				
Alternative A	3,214,000	98%	6,019,000	73%
Alternative B	77,000	0%	1,624,000	0%
Alternative C	77,000	0%	1,624,000	0%
Alternative D	77,000	0%	6,039,000	73%
Proposed LUP Amendments	77,000	0%	5,954,000	73%
Right-of-Way Exclusion//Special Use Authorization				
Alternative A	561,000	32%	677,000	64%
Alternative B	4,824,000	92%	677,000	64%
Alternative C	4,824,000	92%	6,085,000	96%
Alternative D	4,824,000	92%	677,000	64%
Proposed LUP Amendments	564,000	32%	674,000	64%
Right-of-Way Avoidance//Special Use Authorization				
Alternative A	5,107,000	22%	3,134,000	32%
Alternative B	3,988,000	0%	7,549,000	72%

	Priority Habitat Management Areas		General Habitat Management Areas	
Alternative C	3,988,000	0%	2,142,000	0%
Alternative D	3,988,000	0%	3,134,000	32%
Proposed LUP Amendments	8,336,000	52%	3,134,000	32%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within rights-of-way management areas in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

Past, present, and reasonably foreseeable projects within MZ II/VII identified in Tables 4-109 and 4-132 indicate ROW applications are anticipated to continue to increase within MZ II/VII. Major interstate transmission lines are currently proposed in MZ II/VII and may contribute to the cumulative impacts on Greater Sage-Grouse and their habitat. However, by managing BLM-administered and National Forest System lands as ROW/SUA avoidance and exclusion areas, proposed transmission lines would be restricted in Greater Sage-Grouse habitat. Exclusion areas would strictly prohibit ROW/SUA development, while avoidance areas may allow ROW/SUA development subject to restrictions and mitigation.

Exclusion and avoidance areas are intended to minimize disturbance to Greater Sage-Grouse populations by limiting the siting of roads and other ROWs/SUAs which can increase bird mortality, habitat avoidance, habitat fragmentation. Additionally, the location of tall structures can increase predation (Connelly et al. 2004). These impacts would be most prevalent under Alternative A, as this alternative has the most acres of PHMA open to ROWs/SUAs and the fewest areas managed as ROW/SUA avoidance and exclusion within MZ II/VII.

Alternative A has the most acres of PHMA open to ROW/SUA development in MZ II/VII (3,214,000 acres), of which most are located within the Greater Sage-Grouse LUP Amendment planning area. All other action alternatives and the Proposed LUP Amendments reduce the number of PHMA acres open to ROW/SUA in MZ II/VII by 98%. Reasonably foreseeable future ROW/SUA proposals would have fewer restrictions under Alternative A, and would therefore be more likely to impact Greater Sage-Grouse populations and their habitat.

Acres of Greater Sage-Grouse habitat in ROW/SUA exclusion areas in MZ II/VII are highest under Alternative B, C, and D. ROW/SUA exclusion would help protect Greater Sage-Grouse habitat on BLM-administered and National Forest System lands; however, in doing so, non-federal lands could be at greater risk for development as these areas would have less restrictive management.

The Proposed LUP Amendments relies more on ROW/SUA avoidance areas to protect Greater Sage-Grouse habitat rather than ROW/SUA exclusion. This approach preserves management flexibility in situations where land ownership is mixed and may help avoid rerouting ROWs/SUAs across non-federal land when those routes would disturb more Greater Sage-Grouse habitat than if the ROW/SUA was located solely on BLM- administered and National Forest System land. As a result, the incremental effect of implementing the Proposed LUP Amendments, including the anthropogenic disturbance cap and mitigation requirements, in conjunction with past, present, and reasonably foreseeable future actions would be a reduction in disturbance of Greater Sage-Grouse leks, nests, and brood-rearing and wintering areas compared to other alternatives.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming executive order) could be synergistic. By implementing restrictions on infrastructure in PHMA and on state and private lands together, the cumulative beneficial effect on Greater Sage-Grouse would be

greater than the sum of their individual effects because protections would be applied more consistently across the landscape. This is especially important in areas of mixed land ownership patterns where complementary protections can benefit leks, early brood rearing habitat, or other important areas that do not follow geopolitical boundaries.

The cumulative impact of installing multi-state transmission lines and other ROWs/SUAs would include adverse effects to some populations of Greater Sage-Grouse within MZ II/VII. These effects may include lek abandonment; removal, degradation, and fragmentation of habitat; direct mortality through collisions with vehicles; impeding migration; increased risk of predation; and spread of noxious or invasive weeds. Construction of access roads and ancillary facilities in Greater Sage-Grouse habitat would contribute to these negative effects. BMPs, design features, state or BLM field office-specific stipulations, and Forest Service Standards and Guidelines are incorporated into the NEPA documents for many of these proposed transmission lines in MZ II/VII. However, the extent to which these measures are to be implemented during construction is uncertain. Greater Sage-Grouse would be particularly vulnerable to the effects of new transmission lines in Colorado, where reasonably foreseeable future transmission line routes are proposed in both GHMA and PHMA.

Presidential Priority transmission projects that are proposed in MZ II/VII (such as the TransWest Express, Gateway South and Gateway West projects), would not be subject to Greater Sage-Grouse conservation requirements in BLM/Forest Service LUP Amendments, but would be subject to those requirements in applicable state plans and other state and federal laws and regulations. They would also develop their own suite of protective measures analyzed in project-specific NEPA documents. Whether or not these project-specific measures would adequately protect Greater Sage-Grouse is unknown because the measures have not been finalized. Regardless, impacts would likely be greater in Colorado where the TransWest Express proposed route would impact approximately 26 miles in PACs (key habitats that are essential for Greater Sage-Grouse conservation) and 57 miles of PHMA in the BLM Little Snake and White River Field Offices. This impact would be especially harmful to fringe Greater Sage-Grouse populations in Colorado, as some are less robust than those in Wyoming and southern Montana.

Under all alternatives and the Proposed LUP Amendments, the cumulative effect of constructing multiple new transmission lines and other ROWs/SUAs is likely to negatively affect Greater Sage-Grouse and their habitat. However, implementation of the BLM/Forest Service Proposed LUPs, in combination with other regional efforts, would restrict the extent to which proposed ROWs could be located in or near Greater Sage-Grouse habitat, providing more benefit to the species than current management.

Renewable Energy

Nature and Type of Effects. The nature and type of effects associated with renewable energy development is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. While most federal lands are not currently leased or developed for wind or solar, areas of potential development coincide closely with Greater Sage-Grouse habitats in MZ II (Manier et al. 2013). Although not representative of all renewable energy development, wind turbines indirectly influence less than 1 to 2% of priority habitat and general habitat respectively across MZ II/VII. Private lands account for 70% of wind turbines affecting Greater Sage-Grouse in priority habitat (and 73% in general habitat) within MZ II/VII (Manier et al. 2013). Therefore, conservation actions on private land are likely to have a greater potential to ameliorate the effects of wind energy development than any other single land management entity.

Impact Analysis. Table 4-127, Acres of Wind Energy Management Areas in Greater Sage-Grouse Habitat in MZ II/VII, lists acres of PHMA and GHMA managed as open, avoidance, or exclusion to wind ROWs/SUAs.

Table 4-127. Acres of Wind Energy Management Areas in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Open to Wind Rights-of-Way/Special Use Authorization				
Alternative A	1,382,000	100%	5,507,000	62%
Alternative B	0	0%	2,093,000	0%
Alternative C	0	0%	2,093,000	0%
Alternative D	0	0%	5,327,000	61%
Proposed LUP Amendments	0	0%	5,461,000	62%
Wind Right-of-Way/Special Use Authorization Exclusion				
Alternative A	3,793,000	0%	961,000	45%
Alternative B	7,860,000	57%	961,000	45%
Alternative C	7,860,000	57%	6,375,000	92%
Alternative D	7,860,000	57%	961,000	45%
Proposed LUP Amendments	3,796,000	10%	958,000	45%
Wind Right-of-Way/Special Use Authorization Avoidance				
Alternative A	3,717,000	72%	3,346,000	59%
Alternative B	1,032,000	0%	6,775,000	80%
Alternative C	1,032,000	0%	1,362,000	0%
Alternative D	1,032,000	0%	3,346,000	59%
Proposed LUP Amendments	5,184,000	80%	3,323,000	59%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within wind energy management areas in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

Managing wind ROW/SUA avoidance and exclusion areas in Greater Sage-Grouse habitat would reduce or minimize impacts from wind utility infrastructure on BLM-administered and National Forest System land by prohibiting or restricting new ROWs. In addition, renewals or upgrades of existing facilities could incorporate additional conservation actions. Collocation or clustering of facilities would reduce impacts on Greater Sage-Grouse habitat. Managing wind ROW/SUA exclusion and avoidance areas would not preclude existing renewable energy projects from operating.

Under Alternative A, 1,382,000 acres of PHMA in MZ II/VII would be open to wind ROWs/SUAs; 5,507,000 acres of GHMA would be open. Maintaining PHMA as open to wind ROWs/SUAs would increase the risk of development in these areas, as there would be fewer restrictions in place on BLM-administered and National Forest System lands to protect Greater Sage-Grouse.

Under Alternative B, no PHMA in MZ II/VII would be open to wind ROW/SUAs. Therefore, this alternative would provide greater protection to Greater Sage-Grouse habitats and populations compared to alternative A. 7,860,000 acres of PHMA and 961,000 acres of GHMA would be managed as ROW/SUA exclusion; 1,032,000 acres of PHMA and 6,775,000 acres of GHMA would be managed as ROW/SUA avoidance. While wind developments may still occur in Greater Sage-Grouse habitat under Alternative B, avoidance and exclusion management areas would minimize impacts and/or encourage development outside of PHMA. The incremental effects of implementing Alternative B in combination with other regional efforts would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII.

Under Alternative C, acres of wind ROW/SUA exclusion in MZ II/VII would be the greatest. This alternative would be the most restrictive in allowing developments on BLM-administered and National Forest System lands. Wind ROW/SUA exclusion areas would limit the risk of new renewable energy facilities impacting Greater Sage-Grouse; however, non-federal lands could be at greater risk for development as these areas would have less restrictive management. Implementation of the Wyoming and Montana executive orders would help to offset this indirect effect. When combined with other regional efforts including implementation of other Proposed LUPs, Alternative C would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII.

Under Alternative D, acres of wind ROW/SUA exclusion areas in PHMA would be the same as Alternative B and C. Managing wind ROW/SUA exclusion areas in PHMA and GHMA would encourage development away from important Greater Sage-Grouse habitat, which would help to protect sagebrush habitats. When combined with other regional efforts including implementation of other Proposed LUPs, Alternative D would result in a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII.

The Proposed LUP Amendments would rely more on wind ROW/SUA avoidance management in PHMA and GHMA to protect Greater Sage-Grouse, rather than exclusion management areas. This approach preserves management flexibility in situations where land ownership is mixed, and may help avoid rerouting ROWs/SUAs across non-federal land when those routes would disturb more Greater Sage-Grouse habitat than if the ROW/SUA was located solely on BLM-administered or National Forest System land.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming executive order) could be synergistic. By implementing restrictions on infrastructure in PHMA and on state and private lands together, the cumulative beneficial effect on Greater Sage-Grouse would be greater than the sum of their individual effects because protections would be applied more consistently across the landscape. This is especially important in areas of mixed land ownership patterns where complementary protections can benefit leks, early brood rearing habitat, or other important areas that do not follow geopolitical boundaries.

Reasonably foreseeable future projects within MZ II/VII include renewable energy developments, such as the Chokecherry/Sierra Madre Wind Farm in southern Wyoming. Projects that require state agency review or approval would be subject to the Wyoming executive order permitting process for development in Core Population Areas, which would encourage ROW/SUA development outside of Core Population Areas and restrict surface occupancy within 0.6 miles of occupied leks.

Impacts would be minimized on BLM-administered and National Forest System land across all alternatives and the Proposed LUP Amendments by adhering to the wildlife protection provisions of the Wind Energy Development Programmatic EIS (BLM 2005). Implementation of wind energy ROW avoidance in PHMA for all BLM/Forest Service Proposed LUPs, in combination with the disturbance caps under the state plans, exclusion zones in other BLM and Forest Service planning areas, and other past, present, and reasonably foreseeable future actions, would result in a net conservation gain to Greater Sage-Grouse in MZ II/VII.

Grazing/Free-Roaming Equids

Nature and Type of Effects. The nature and type of effects associated with grazing/free-roaming equids is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I. Additionally, because horses separate themselves from cattle by using steeper slopes and higher elevations, horse occupancy reduces the occurrence of ungrazed areas (Connelly et al. 2004).

Conditions in MZ II/VII. In general, the risks to Greater Sage-Grouse and their habitat associated with improper grazing practices are less in the northerly, wetter parts of Greater Sage-Grouse range (i.e., MZ I and northern portions of MZ II/VII) than across the arid semi-deserts of MZ II/VII. Nonetheless, livestock grazing is widespread across MZ II/VII, and may, if improperly conducted, pose a substantial threat to Greater Sage-Grouse habitat (Stiver et al. 2006).

A large portion of the central regions of MZ II/VII (approximately 5 million acres) is federally managed wild horse range, suggesting potential effects to Greater Sage-Grouse from livestock grazing and the compounding effects of free-roaming equids (Manier et al. 2013). Within MZ II/VII, 19.9% of priority habitats are negatively influenced by free-roaming equids (Manier et al. 2013).

Impact Analysis. Table 4-128 lists the acres of PHMA and GHMA available and unavailable for grazing, by alternative.

Table 4-128. Acres Available and Unavailable to Livestock Grazing in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Available to Livestock Grazing				
Alternative A	8,813,000	50%	9,793,000	60%
Alternative B	8,813,000	50%	9,793,000	60%
Alternative C	4,372,000	0%	9,793,000	60%
Alternative D	8,813,000	50%	9,793,000	60%
Proposed LUP Amendments	8,901,000	51%	9,705,000	59%
Unavailable to Livestock Grazing				
Alternative A	28,000	0%	16,000	19%
Alternative B	28,000	0%	16,000	19%
Alternative C	4,469,000	99%	16,000	19%
Alternative D	28,000	0%	16,000	19%
Proposed LUP Amendments	28,000	0%	16,000	19%

Source: BLM 2015
This table displays the acres of PHMA and GHMA available and unavailable to livestock grazing in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

Acres of PHMA and GHMA unavailable to livestock grazing would be similar across alternatives (including the Proposed LUP Amendments), with the exception of Alternative C. Under Alternative C, 4,469,000 acres of PHMA and 16,000 acres of GHMA would be unavailable to livestock grazing. These

restrictions would help to protect Greater Sage-Grouse habitat from the risk of improper grazing on BLM-administered and National Forest System lands; however, greater restrictions on BLM-administered lands and National Forest System lands could increase grazing pressure on adjacent private lands.

As literature suggests that moderate grazing is compatible with Greater Sage-Grouse habitat (Strand and Launchbaugh 2013), closing acres to grazing may not itself benefit or harm Greater Sage-Grouse. As described above under *Nature and Type of Impacts*, possibly equally or more beneficial is restricting range improvements in Greater Sage-Grouse habitat, limiting fencing, and effectively implementing range health standards on grazing allotments in Greater Sage-Grouse habitat.

The COT report objectives for livestock grazing are to manage grazing in a manner consistent with local ecological conditions. This type of management would maintain or restore healthy sagebrush shrub and native perennial grass and forb communities and conserve essential habitat components for Greater Sage-Grouse. The COT report also states that land managers should avoid or reduce the impact of range management structures on Greater Sage-Grouse habitat.

Under the Proposed LUP Amendments, management actions specifically related to Greater Sage-Grouse would help reduce the threat of grazing throughout the MZ to meet the COT report objectives. For example, the BLM and Forest Service will prioritize (1) the review of grazing permits/leases, in particular to determine if modification is necessary prior to renewal, and (2) the processing of grazing permits/leases in SFAs followed by PHMAs outside of the SFAs. Proposed LUPs in MZ II/VII would also prioritize SFAs for grazing permit renewals. These actions would provide an opportunity to adjust forage levels to meet rangeland health standards, thereby reducing the risk of nonfunctioning rangelands impacting Greater Sage-Grouse habitats throughout MZ II/VII. Additionally, under the Proposed LUP Amendments existing range improvements (e.g., fences, livestock/wildlife watering facilities) in GHMA and PHMA would continue to be evaluated and modified when necessary.

Similar Greater Sage-Grouse conservation measures are included under Alternatives B, D, and C. For example under Alternative B, in PHMA, existing structural range improvements and location of supplements (salt or protein blocks) would be evaluated to make sure they conserve, enhance, or restore Greater Sage-Grouse habitat. The same management action would apply under Alternative C to both PHMA and GHMA. Under Alternative D, in Greater Sage-Grouse core and connectivity habitats, existing range improvements associated with grazing management operations would continue to be evaluated and modified when necessary for reduced impacts on Greater Sage-Grouse and its habitat. Under Alternative D, in Greater Sage-Grouse GHMA, core, and connectivity habitats, existing range improvements (e.g., fences, livestock/wildlife watering facilities) associated with grazing management operations would continue to be evaluated and modified when necessary for reducing impacts on Greater Sage-Grouse and its habitat.

The BLM establishes an AML for each HMA, which represents the population objective for free-roaming equids. Under all alternatives and the Proposed Action, the BLM has the ability to adjust AMLs of wild horses if resource damage occurs. Additionally, under the Proposed LUP Amendments, the BLM would review and consider amending HMA plans to incorporate Greater Sage-Grouse habitat objectives and management considerations for all BLM HMAs within PHMA. Under all action alternatives, the BLM will collaborate with appropriate federal agencies, and the State of Wyoming as contemplated under the Wyoming executive order to: determine if a causal relationship exists between improper grazing (by wildlife, wild horses, or livestock) and Greater Sage-Grouse conservation objectives, and identify appropriate site-based action to achieve Greater Sage-Grouse conservation objectives within the framework. This would result in a net conservation gain for Greater Sage-Grouse in MZ II/VII under all action alternatives.

BLM/Forest Service grazing and free-roaming equid management actions in MZ II/VII would not apply on non-federal lands. Conservation initiatives conducted through NRCS's SGI would have a greater direct impact towards ameliorating the threat on these lands. Since 2010, SGI has enhanced rangeland health through rotational grazing systems, revegetating former rangeland with sagebrush and perennial grasses, and control of invasive weeds. On privately owned lands, SGI has developed a prescribed grazing approach that balances forage availability with livestock demand. This system allows for adjustments to timing, frequency, and duration of grazing, ensuring rangelands are managed sustainably to provide continued ecological function of sagebrush-steppe. A primary focus of the prescribed grazing approach is maintenance of key plant species, such as deep-rooted perennial grasses that have been shown to be essential for ecological resistance to invasive annual grasses (Reisner et al. 2013, pp. 1047-1048). These actions help to alleviate the adverse impacts associated with improper grazing practices outlined above under *Nature and Type of Effects*. Within MZ II/VII, SGI has implemented 552,600 acres of prescribed grazing systems. This program is likely the largest and most impactful program on private lands within MZ II/VII. Because of its focus on priority areas for conservation, which often overlap PHMA, the SGI's past, present, and reasonably foreseeable work has had and likely will continue to have a cumulative beneficial impact on Greater Sage-Grouse when considered alongside protective BLM and Forest Service management actions in PHMA.

CCAAs are another tool being implemented to protect private lands from the threat of improper grazing. CCAAs are voluntary conservation agreements between the USFWS and one or more federal or private partners (e.g., the BLM). In return for managing lands to benefit Greater Sage-Grouse, landowners receive assurances against additional regulatory requirements should Greater Sage-Grouse be listed under the ESA. Within Wyoming, the USFWS and Wyoming Governor's Office in conjunction with the BLM, NRCS, Forest Service, and other agencies, have developed an umbrella CCAAs for range management activities. Enrolled landowners are expected to comply with grazing specific conservation measures including but not limited to: avoid (or rotationally utilize) known nesting and brood-rearing habitat as a location for activities that concentrate livestock such as stock tank placement branding and roundup; place salt or mineral supplements in sites minimizing impacts to Greater Sage-Grouse habitat; and within 24 months develop and implement a written grazing management plan to maintain or enhance the existing plant community as suitable Greater Sage-Grouse habitat (USFWS 2013).

The incremental effects of implementing NRCS actions under the SGI (including fence marking and conservation easements), CCAAs, state efforts to maintain ranchland, and BLM and Forest Service management actions (related to grazing) would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII. This benefit would be most pronounced under the Proposed LUP Amendments and Alternative B and D because Greater Sage-Grouse specific conservation measures would be incorporated into grazing management practices without exerting pressure on non-BLM-administered lands and non-National Forest System lands.

Spread of Weeds

The nature and type of effects associated with the spread of weeds is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. By means of seeds carried by wind, humans, machinery, and animals, invasive and noxious weeds have invaded and will continue to invade many locations in MZ II/VII, including the planning area. Cheatgrass (one of the primary invasive species threatening Greater Sage-Grouse habitat) is found throughout MZ II/VII.

The BLM and Forest Service currently manage weed infestations through integrated weed management, including biological, chemical, mechanical, manual, and educational methods. Weed management on BLM-administered lands is guided by the 1991 and 2007 RODs for Vegetation Treatment on BLM Lands

in Thirteen Western States (BLM 1991) and by the 2007 Programmatic Environmental Report (BLM 2007). Weeds are managed in cooperation with county governments and represent a landscape-level approach across management jurisdictions.

Impact Analysis. Increased surface disturbance, motorized transportation, and animal and human activity would increase the chance for invasive plants to establish and spread.

Use of an integrated weed management approach for combating infestations will continue under all alternatives and the Proposed LUP Amendments. Increased activity (e.g., surface disturbance, motorized transportation, and animal or human activity) would increase the likelihood for the spread and establishment of invasive plants, regardless or surface land ownership. Management under Alternative A and D would allow for the most acres of surface disturbance within Greater Sage-Grouse habitat in MZ II/VII; therefore, the potential for invasive weed spread and establishment would be greatest under this alternative, and effects to Greater Sage-Grouse (e.g. reduction in quality of habitat would be more pronounced). Alternatives B, C, and the Proposed LUP Amendments would place more restrictions on resource uses within Greater Sage-Grouse habitat on federal land when compared to Alternative A and D. Therefore, fewer disturbances associated with resource uses is likely to occur under these alternatives, which would reduce the potential for invasive weed spread and establishment.

Relevant cumulative actions that result in surface-disturbing activities would increase the potential for the spread of invasive weeds on federal and non-federal lands. Projects subject to the general stipulations outlined in the Wyoming and Montana executive orders are required to control noxious and invasive weed species and to use native seed mixes during reclamation processes. These stipulations would benefit Greater Sage-Grouse habitat by limiting the spread or establishment of invasive species, particularly on lands that lack BLM or Forest Service protective regulatory mechanisms. These strategies in combination with state and county noxious weed regulations, continued integrated weed management practices, and other past, present and reasonably foreseeable future actions would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII under the Proposed LUP Amendments and other action alternatives by restoring degraded sagebrush habitat and increasing native forbs, thus improving nest cover and food supply. However, complete weed eradication within MZ II/VII is not anticipated under any alternative or the Proposed LUP Amendments because of the scale and scope of efforts needed for complete eradication.

Conversion to Agriculture/Urbanization

Nature and Type of Effects. The nature and type of effects associated with conversion to agriculture/urbanization is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. Less than 1% of priority habitat and 2% of general habitat in MZ II/VII are directly influenced by agricultural development, and 80% of these habitats are within approximately 4 miles of agricultural land (Manier at al 2013). Approximately 4% of habitat has been converted for agricultural use in the Wyoming Basin compared to 19% in the Great Plains (i.e., MZ I).

Urban development similarly causes permanent loss of Greater Sage-Grouse habitat. Human population centers continue to grow and expand. The direct footprint of urban development is higher in PHMA in MZ II/VII compared to other parts of Greater Sage-Grouse range, though still low (approximately 1%) compared to other threats (Manier et al. 2013). In some Colorado counties, 50% of sage-grouse habitat has been subdivided, while an estimated 3 to 5% of all historical habitat in Colorado has been converted into urban areas (Braun 1998; USFWS 2010).

Impact Analysis. As shown below in Table 4-129, Acres Identified for Retention and Disposal in Greater Sage-Grouse Habitat in MZ II/VII, these acreages vary little in the planning area or in MZ II/VII among the alternatives.

Table 4-129. Acres Identified for Retention and Disposal in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Acres Identified for Retention				
Alternative A	7,180,000	61%	9,016,000	64%
Alternative B	7,213,000	62%	9,016,000	64%
Alternative C	7,213,000	62%	9,016,000	64%
Alternative D	7,213,000	62%	9,016,000	64%
Proposed LUP Amendments	7,301,000	62%	8,928,000	63%
Acres Identified for Disposal				
Alternative A	59,000	0%	156,000	62%
Alternative B	24,000	0%	156,000	62%
Alternative C	24,000	0%	156,000	62%
Alternative D	24,000	0%	156,000	62%
Proposed LUP Amendments	24,000	0%	156,000	62%

Source: BLM 2015
This table displays the acres of PHMA and GHMA identified for retention and disposal in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

BLM and Forest Service land tenure adjustments require site-specific NEPA analysis, and land sales must meet specific disposal criteria. Lands identified for disposal in MZ II/VII are typically small isolated parcels that are difficult to manage and do not have high resource value. BLM and Forest Service land tenure adjustments are not anticipated to be a significant contributing element to the threat of agricultural conversion because of the small number of acres involved and the criteria in place that would reduce the likelihood of disposing of parcels containing significant wildlife value, (such as those lands containing leks, early brood rearing habitat, or winter habitat). As a result, cumulative impacts would vary relatively little across alternatives and BLM/Forest Service management would have little impact on alleviating this threat.

Studies of agricultural conversion risk on grasslands have shown a high probability of grassland plots being converted to cropland under current economic and climatic conditions (Rashford et al. 2013). The recent federal Farm Bill tried to discourage converting prairie to cropland by denying crop insurance for such conversions. Nevertheless, if corn and other crop prices remain high, the economic incentive to convert parcels to cropland in Greater Sage-Grouse habitat areas will continue and will potentially increase.

The COT Report objectives for converting land to agriculture are to avoid further loss of sagebrush habitat for agricultural activities (both plant and animal production) and to prioritize restoration. In areas where taking agricultural lands out of production has benefited Greater Sage-Grouse, the programs supporting

these actions should be targeted and continued (USFWS 2013). In accordance with this objective, the NRCS's SGI program focuses on maintaining ranchland that provides habitat for Greater Sage-Grouse.

This voluntary program provides private landowners with monetary incentives to protect Greater Sage-Grouse habitat, often through conservation easements. As a result, private land containing Greater Sage-Grouse habitat is protected from conversion to agriculture or other development for the life of the conservation agreement. The conservation easements and other conservation incentives, such as water feature restoration and fence marking, can enhance the ability of private ranchlands to support Greater Sage-Grouse. As of 2015, SGI has secured conservation easements on 243,400 acres within MZ II/VII, and marked or removed 23 miles of fence (NRCS 2015). This has preserved habitat and reduced the risk of direct mortality on these lands.

These efforts, in conjunction with BLM and Forest Service management, would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII, but its impact would be localized and not likely to ameliorate the threat because of limited management authority.

Fire

Nature and Type of Effects. The nature and type of effects associated with fire is described under Section 4.23.6, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. Fuels models predict fire risk as generally low across MZ II/VII with 10% of priority habitat and general habitat at high risk for fire (Manier et al. 2013).

Impact Analysis. BLM/Forest Service management in MZ II/VII that addresses Greater Sage-Grouse habitat needs during wildfire response and prescribed burns would benefit the species by limiting habitat loss in the event of a wildfire or reducing potential impacts associated with prescribed burning. Under all action alternatives and the Proposed LUP Amendments, BLM and Forest Service planning units (Districts and Forests), in coordination with USFWS and relevant state agencies would complete and continue to update Greater Sage-Grouse Landscape Wildfire and Invasive Species Habitat Assessments to prioritize at-risk habitats, and identify fuels management, preparedness, suppression and restoration priorities necessary to maintain sagebrush habitat to support interconnecting Greater Sage-Grouse populations. In addition, all action alternatives and the Proposed LUP Amendments would implement a coordinated inter-agency approach to fire restrictions based upon National Fire Danger Rating System thresholds (fuel conditions, drought conditions, and predicted weather patterns) for Greater Sage-Grouse habitat. Alternative A does not include these measures during wildfire response and prescribed burning; therefore, Alternative A would afford less protection to Greater Sage-Grouse habitats and populations compared to Alternative B, C, D, and the Proposed LUP Amendments.

Under Alternative C, fuels treatments would be designed and implemented to protect sagebrush systems in PHMA and GHMA. Under Alternative B and the Proposed LUP Amendments, fuels treatments would be designed and implemented to protect sagebrush systems in priority habitats only. Under Alternatives A and D, Fuels treatments would not be designed and implemented to specifically protect sagebrush systems in PHMA and GHMA. As such, Alternative C would afford the greatest protection of Greater Sage-Grouse habitat from fuels treatments in MZ II/VII, while Alternatives A and D would afford the less protection.

The Wyoming and Montana executive orders emphasize fire suppression in Core Population Areas, while recognizing other suppression priorities may take precedence. This would benefit Greater Sage-Grouse habitat during wildfire planning and response, particularly on lands not administered by the BLM or Forest Service.

WAFWA's guidance on fire and fuels management for Greater Sage-Grouse conservation (WAFWA 2014) promotes coordination among local fire response agencies similar to a "natural disaster" response; it emphasizes the importance of fuel breaks and the need to incorporate Greater Sage-Grouse habitat objectives in fire management, as well as the use of grazing as a fuel reduction tool.

On the local level, the Upper Green River Basin Sage-Grouse Conservation Plan (Upper Green River Basin Sage-Grouse Working Group 2007) recommends evaluating wildfire greater than 40 acres in occupied Greater Sage-Grouse habitat to determine if rehabilitation of the burned area is needed, with emphasis placed on habitats that would be susceptible to invasion by annual grasses. Other LWGs in MZ II/VII include similar recommendations.

Recognition of the importance of sagebrush habitat during interagency wildfire response would benefit the Greater Sage-Grouse in the event of an unplanned fire. The Interagency Standards for Fire and Fire Aviation Operations "Red Book" includes a BMP for Greater Sage-Grouse habitat conservation for wildland fire and fuels management (BLM 2013). This document serves as supplemental policy or guidance for the BLM, Forest Service, and USFWS. This BMP would benefit the Greater Sage-Grouse (particularly during interagency wildland fire operations) by utilizing spatial habitat data and using predictive services to prioritize and preposition firefighting resources in critical habitat areas. The coordination of federal, state, and local fire prevention actions, changes in fire management, and other past, present, and reasonably foreseeable future actions would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII. This is in accordance with the COT report objective to retain and restore healthy native sagebrush plant communities within the range of Greater Sage-Grouse (USFWS 2013). The gain would be greatest under Alternative B, C, D, and the Proposed LUP Amendments because of the management actions which emphasize preserving Greater Sage-Grouse habitat and minimizing damage associated with fire.

Recreation

Nature and Type of Effects. The nature and type of effects associated with recreation is described under **Section 4.23.6**, Threats to Greater Sage-Grouse in MZ I.

Conditions in MZ II/VII. The BLM, Forest Service and other agencies provide a variety of dispersed recreation opportunities within MZ II/VII governed by laws, policy, and guidance. Typical recreation activities within MZ II/VII include camping, hiking, boating, OHV use, biking, and fishing. Recreation also occurs on private land with fewer restrictions. Within the planning area, year-round dispersed recreational opportunities are available. Increased visitation to small towns and destination resorts contribute to the increased use of public lands.

Impact Analysis. Table 4-130 shows Acres of Travel Management Designations in Greater Sage-Grouse Habitat in MZ II/VII.

Table 4-130. Acres of Travel Management Designations in Greater Sage-Grouse Habitat in MZ II/VII

	Priority Habitat Management Areas		General Habitat Management Areas	
	MZ II/VII	Percent Within Planning Area	MZ II/VII	Percent Within Planning Area
Open				
Alternative A	5,000	80%	58,000	16%
Alternative B	1,000	0%	58,000	16%
Alternative C	1,000	0%	58,000	16%

	Priority Habitat Management Areas		General Habitat Management Areas	
Alternative D	5,000	80%	58,000	16%
Proposed LUP Amendments	5,000	80%	58,000	16%
Limited				
Alternative A	8,776,000	50%	9,416,000	59%
Alternative B	8,780,000	50%	9,416,000	59%
Alternative C	8,780,000	50%	9,416,000	59%
Alternative D	8,776,000	50%	9,416,000	59%
Proposed LUP Amendments	8,861,000	50%	9,322,000	59%
Closed				
Alternative A	108,000	59%	369,000	71%
Alternative B	108,000	59%	369,000	71%
Alternative C	108,000	59%	369,000	71%
Alternative D	108,000	59%	369,000	71%
Proposed LUP Amendments	112,000	60%	366,000	71%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within travel management designations of open, limited and closed in MZ II/VII; it also displays the percentage of those acres that are found within the planning area.

The COT Report objectives for recreation are to maintain healthy native sagebrush communities, based on local ecological conditions, and to manage direct and indirect human disturbance (including noise) to avoid interruption of normal Greater Sage-Grouse behavior (USFWS 2013). Limits on road use under the action alternatives and Proposed LUP Amendments, as well as restrictions for OHVs would help meet these objectives.

As shown in Table 4-130, travel management designations in PHMA and GHMA have little variance between alternatives. 5,000 acres of PHMA would be designated as open cross country travel under Alternatives A, D, and the Proposed LUP Amendments. Fewer acres of PHMA would be designated as open under Alternative B and C. Impacts associated with recreation (e.g., soil compaction, loss of sagebrush habitat, behavior changes, and collisions) would be more likely to occur in these areas; however, impacts would be localized as less than one tenth of 1% of all PHMA in MZ II/VII would be open to cross country travel under all alternatives and the Proposed LUP Amendments.

The majority of Greater Sage-Grouse habitat would be designated as limited to existing routes under all Alternatives and the Proposed LUP Amendments. As such, OHVs would be prohibited from traveling off existing routes, which would reduce the risk of direct and indirect effects from recreation motorized vehicles. On existing routes which travel through PHMA and GHMA, noise disturbance or direct mortality through collision may occur. Seasonal road closures identified during the travel management process would help to reduce this impact. Additionally, the anthropogenic disturbance cap restrictions under the all action alternatives would limit new road construction in Greater Sage-Grouse habitat.

On the local level, the Northeast Wyoming Greater Sage-Grouse Conservation Plan (Northeast Wyoming Sage-Grouse Working Group 2014) identifies recommendations for reducing impacts associated with

recreation. These recommendations include but are not limited to: locate recreation facilities at least 2 miles (3.2 km) from lek sites or in areas that do not contain important Greater Sage-Grouse habitat, avoid camping within important riparian habitats occupied by Greater Sage-Grouse during late summer, and avoid recreation activities in sage-grouse nesting habitat during the nesting season. Other LWGs within MZ II/VII include similar recommendations in their conservation plans. These actions could help ameliorate the threat on non-federal lands.

Implementation of any action alternatives or the Proposed LUP Amendments as described above, in concert with travel management planning on BLM-administered and National Forest System lands within MZ I, the disturbance caps applied under the state plans, and other past, present, and reasonably foreseeable future actions would help reduce the threat of recreation and travel on Greater Sage-Grouse populations and habitats and would provide a net conservation gain to Greater Sage-Grouse habitats and populations in MZ II/VII.

Conifers

Nature and Type of Effects. Conifer woodlands, especially juniper (*Juniperus* spp.) and in some regions pinyon pine (*Pinus edulis*), may expand into sagebrush habitat and reduce availability of habitat for Greater Sage-Grouse. Conifer expansion may be encouraged by human activities, including fire suppression and grazing (Miller et al. 2011). If woodland development is sufficient to restrict shrub and herbaceous understory growth, habitat quality for Greater Sage-Grouse will be reduced (Connelly et al. 2004). Mature trees offer perch sites for raptors; thus, woodland expansion may also increase the threat of predation, as with power lines (Manier et al. 2013). Locations within approximately 1000 yards of current pinyon-juniper woodlands are at highest risk of expansion (Bradley 2010). The greatest risks from conifer encroachment are thought to be in the Great Basin, with smaller risks (6 to 7% of priority habitat and general habitat) in the Wyoming Basin (Connelly et al. 2004; Manier et al. 2013). Studies have shown that Greater Sage-Grouse incur population-level impacts at very low levels of conifer encroachment (Baruch-Mordo et al. 2013).

Conditions in MZ II/VII. Approximately 46% of conifer encroachment risk in priority habitat (and 43% in general habitat) occur on BLM-administered lands within MZ II/VII (Manier et al. 2013). Therefore, BLM actions are likely to have a greater potential to ameliorate the effects of conifer encroachment on Greater Sage-Grouse than any other single land management entity.

Impact Analysis. The COT objective is to remove pinyon-juniper from areas of sagebrush that are most likely to support Greater Sage-Grouse (post-removal) at a rate that is at least equal to the rate of pinyon-juniper incursion (USFWS 2013, p. 47).

Under the Proposed LUP Amendments, the BLM would prioritize conifer treatments closest to occupied Greater Sage-Grouse habitats and near occupied leks, and where juniper encroachment is phase 1 or phase 2. Use of site-specific analysis and principles like those included in the FIAT report (Chambers et al. 2014) and other ongoing modeling efforts to address conifer encroachment will help refine the location for specific priority areas to be treated. These actions would benefit Greater Sage-Grouse by improving habitat quality and functionality. No other similar management decision was made under Alternatives A, B, C, or D.

Recommendations within the Wyoming Greater Sage-Grouse Conservation Plan (Wyoming Sage-Grouse Working Group 2003) call for removal of juniper and other conifers where they have invaded sagebrush sites important to Greater Sage-Grouse, which could help ameliorate the threat on lands not administered by the BLM and Forest Service. On state and private lands in Colorado, the Colorado Parks and Wildlife has conducted conifer encroachment treatments on sagebrush habitats and has worked with private landowners to promote habitat restoration. For example, since 2008, the Colorado Parks and Wildlife has

conducted six treatment projects within the northwest Colorado population totaling 2,600 acres (Colorado Department of Natural Resources 2013). These types of conifer treatment projects, in combination with other habitat restoration efforts in Wyoming, Utah, and Montana, would reduce the conifer encroachment threat throughout MZ II/VII.

The SGI has helped reduce the threat of early succession conifer encroachment through mechanical removal on 10,500 acres of private lands within MZ II/VII. The majority of these efforts were located inside PACs (NRCS 2015), helping to preserve historic fire-return intervals within important Greater Sage-Grouse habitat. While the threat of conifer encroachment is likely to continue under all alternatives and the Proposed LUP Amendments, implementing mechanical treatments, reintroduction of appropriate fire regimes, and implementing BLM RDFs and BMPs (e.g., removing standing and encroaching trees within 100 meters [328 feet] of occupied leks and other Greater Sage-Grouse habitats) would result in a net conservation gain for Greater Sage-Grouse habitats and populations. This gain would likely be greatest under the Proposed LUP Amendments, as conifer treatments would be prioritized closest to occupied Greater Sage-Grouse habitats and near occupied leks, and where juniper encroachment is phase 1 or phase 2.

4.23.8 Conclusions

In addition to BLM and Forest Service management in the Greater Sage-Grouse LUP Amendment planning area and other planning areas throughout MZ I and II/VII, Greater Sage-Grouse will also be impacted by management and conservation at state, regional, and local levels. This analysis takes into account each alternative in the Greater Sage-Grouse LUP Amendments in conjunction with state and private initiatives and other past, present, and reasonably foreseeable future actions. For purposes of this analysis, the BLM and Forest Service have determined that the Proposed LUPs for the other ongoing Greater Sage-Grouse planning efforts in MZ I and II/VII are reasonable foreseeable future actions.

Some of the most important past, present, and reasonably foreseeable future actions benefitting Greater Sage-Grouse populations on private land in MZ I and II/VII are the conservation easements coordinated by the NRCS SGI, State of Wyoming, State of Colorado, State of Montana, BLM, Forest Service, and other agencies and organizations. As of 2015, the SGI has secured conservation easements on 65,900 acres within MZ I, and 243,400 acres within MZ II/VII. Additionally, the SGI has worked with landowners to increase fence marking, native vegetation seeding, and conifer removal, and to implement prescribed livestock grazing systems to help alleviate the adverse impacts associated with improper grazing practices. Future coordination of private landowners within SGI is expected to provide further benefits to Greater Sage-Grouse habitat.

This coordination with private landowners enhances conservation in addition to what BLM and Forest Service management can accomplish on BLM-administered and National Forest System lands. Ranchers in Wyoming and Montana are also using CCAAs with USFWS. Under these instruments, ranchers voluntarily agree to manage lands to reduce threats to Greater Sage-Grouse in exchange for a guarantee that they will not be subject to additional regulations should the species become listed. While ranchers have used these agreements across the Greater Sage-Grouse range, thus far the agreements have been applied to only a small number of ranches in Wyoming and Montana.

As discussed in Section 4.23.4. Colorado, Idaho, Montana, Utah, and Wyoming have adopted regulatory statewide plans to promote Greater Sage-Grouse conservation throughout MZ I and II/VII. Wyoming's plan implements a Core Population Area Strategy with well density limitations, timing restrictions, and a uniform 5-percent disturbance cap across all land ownership types. These measures would improve Greater Sage-Grouse population levels if effectively enforced (Copeland et al. 2013). Other state plans include similar, if sometimes less aggressive, measures to reduce impacts on state lands. In Montana, a 5% limit on

anthropogenic disturbance is applied within the DDCT examination area (based upon occupied leks within any given core population area). Similarly in Utah, the Conservation Plan for Greater Sage-Grouse in Utah (Utah Division of Wildlife Resources 2013), includes under certain circumstances, a general limit on new permanent disturbance of 5% of habitat on state or federally managed lands within any particular Sage-grouse Management Area.

Alternative A: Current Management

Under Alternative A, current management would continue on BLM-administered lands and National Forest System lands in the planning area. Direction contained in existing laws, regulations and policy would continue to be implemented. The BLM and Forest Service would not designate PHMA or GHMA, and would not manage any additional ROW avoidance or exclusion areas within the Greater Sage-Grouse LUP Amendment planning area. Appropriate and allowable uses and restrictions with regard to such activities as mineral leasing and development, recreation, utility corridors, and livestock grazing would also remain unchanged.

In the remainder of MZ I and II/VII, other BLM/Forest Service LUP Amendments planning efforts would implement their Proposed LUP Amendments to improve protection of Greater Sage-Grouse and their habitat. In addition, other regional Greater Sage-Grouse conservation strategies, as discussed in Section 4.23.4, would be implemented on non-federal lands. As a result, the lack of protections under the Alternative A would be offset to an extent by more-protective management elsewhere in MZ I and II/VII. However, in the Greater Sage-Grouse LUP Amendment planning area, current management would do little to reduce the present and widespread threats which face Greater Sage-Grouse in MZ I and II/VII. Although current management actions, (including the temporary BLM Greater Sage-Grouse Instruction Memoranda and interim Forest Service Conservation Recommendations), provide a limited array of conservation measures that are intended to avoid continued degradation of Greater Sage-Grouse habitat in MZ II/VII, they would not be subject to the same development restrictions in Greater Sage-Grouse habitat under Alternative A as they would under the action alternatives or the Proposed LUP Amendments. Thus Alternative A would not meet the goals and objectives in this LUP Amendments to identify and incorporate conservation measures for Greater Sage-Grouse; it may meet the COT report objectives for present and widespread threats to Greater Sage-Grouse, but only in localized areas and not on BLM-administered lands or National Forest System lands within the Greater Sage-Grouse LUP Amendment planning area.

Alternative B

Alternative B is based on the conservation measures found in *A Report on National Greater Sage-Grouse Conservation Measures* (NTT 2011). Under this alternative, management actions focused on protecting Greater Sage-Grouse and its habitat would be implemented, including designating PHMA and GHMA and managing new ROW exclusion and avoidance areas. A surface disturbance cap of 3% per 640 acres is considered within sage-grouse priority habitat.

Implementing these protective measures on BLM-administered and National Forest System lands within the Greater Sage-Grouse LUP Amendment planning area would help preserve Greater Sage-Grouse habitat, but may risk pushing development onto adjacent lands with fewer regulatory constraints. This indirect effect would be mostly offset by the conservation measures contained in the Wyoming and Montana executive orders. In the remainder of MZ I and II/VII, other BLM/Forest Service planning efforts would implement their Proposed LUPs to improve protection of Greater Sage-Grouse and their habitat. In addition, other regional Greater Sage-Grouse conservation strategies, as discussed in Section 4.23.4, would be implemented on non-federal lands. The incremental effects of other regional efforts, combined with implementation of Alternative B, would result in a net conservation gain for Greater Sage-Grouse in MZ II/VII.

Alternative C

Alternative C is based on the citizen groups recommended alternative. This alternative emphasizes improvement and protection of habitat for Greater Sage-Grouse is applied to all occupied Greater Sage-Grouse habitat. Alternative C would limit commodity development in areas of occupied Greater Sage-Grouse habitat, and would close or designate portions of the planning area to some land uses. Under Alternative C a surface disturbance cap of 3% per 640 acres is considered within PHMA.

Implementing these protective measures on BLM-administered and National Forest System lands within the Greater Sage-Grouse LUP Amendment planning area would help preserve Greater Sage-Grouse habitat, but would risk pushing development onto adjacent lands with fewer regulatory constraints. This indirect effect would be mostly offset by the conservation measures contained in the Wyoming and Montana executive orders for some resource uses. Grazing restrictions would reduce Greater Sage-Grouse disturbance, although exclusion of livestock from BLM-administered lands and National Forest System lands could require additional fencing, which would increase predation and collision risk and contribute to fragmentation. In the remainder of MZ I and II/VII, other Proposed LUPs would be implemented to improve protection of Greater Sage-Grouse and their habitat. In addition, other regional Greater Sage-Grouse conservation strategies, as discussed in Section 4.23.4, would be implemented on non-federal lands. The COT report objectives for fire, invasive plants, range management, recreation, infrastructure, energy, and mining would likely be met. The incremental effects of other regional efforts, combined with implementation of Alternative B, would result in a net conservation gain for Greater Sage-Grouse habitats and populations in MZ I and II/VII. However, the strict protective measures on BLM-administered lands may have the effect of increasing resource development pressure on non-BLM administered and National Forest System lands, thereby reducing conservation gains due to habitat fragmentation on private land.

Alternative D

Alternative D provides opportunities to use and develop the planning area while providing protection of Greater Sage-Grouse habitat based on scoping comments and input from cooperating agencies involved in the alternatives development process. This alternative increases the potential for development and resource use, with reduced Greater Sage-Grouse habitat protections. Protective measures would be applied to Greater Sage-Grouse habitat. Under this alternative, a surface disturbance cap of 9% per 640 acres is considered within Greater Sage-Grouse core habitat.

In the rest of MZ I and II/VII, other Proposed LUPs would be implemented to improve protection of Greater Sage-Grouse and their habitat. In addition, other regional Greater Sage-Grouse conservation strategies as discussed in Section 4.23.4, would be implemented on non-federal lands. COT objectives for fire, invasive plants, range management, recreation, infrastructure, energy, and mining would likely be met in these areas. However, within the Greater Sage-Grouse LUP Amendment planning area, the limited protective measures would not identify and incorporate conservation measures for Greater Sage-Grouse and would not meet the COT report objectives.

Proposed LUP Amendments

The BLM/Forest Service's Proposed LUP Amendments provide a layered management approach that offers the highest level of protection for Greater Sage-Grouse in the most valuable habitat. Land use allocations in the Proposed LUP Amendments would limit or eliminate new surface disturbance in PHMAs while minimizing disturbance in GHMAs. In addition to establishing protective land use allocations, the Proposed LUP Amendments would implement a suite of management tools including but not limited to: disturbance limits, Greater Sage-Grouse habitat objectives and monitoring, and adaptive management triggers and responses. The Proposed LUP Amendments seeks to allocate resources among competing human interests and land uses and to conserve natural resource values, including Greater Sage-Grouse habitat. As a result,

development would be allowed on federal lands with certain restrictions and precautions taken to preserve Greater Sage-Grouse habitat. This could reduce development pressure on nonfederal lands, compared to Alternative C, where less regulatory protections are afforded to Greater Sage-Grouse, by not entirely prohibiting development on BLM and National Forest System lands. Additionally, approximately 150,200 acres managed as GHMA in Alternative A through D are managed as PHMA (core or connectivity habitat) in the Proposed LUP Amendments on National Forest System lands. Some objectives and standards apply to PHMA and not GHMA; therefore, designating additional acres of GHMA as PHMA under the Proposed LUP Amendments would help to maintain or enhance habitat connectivity, particularly for the Jackson Hole population where isolation/small size is considered a present and widespread threat (USFWS 2013).

In the rest of MZ I and II/VII, other Proposed LUPs would be implemented to improve protection of Greater Sage-Grouse and their habitat. In addition, other regional Greater Sage-Grouse conservation strategies as discussed in Section 4.23.4, would be implemented on non-federal lands. Reasonably foreseeable future actions in MZ I and II/VII such as proposed oil and gas developments, interstate transmission lines, and other land disturbance projects would be subject to the requirements set forth in the BLM and/or Forest Service Proposed LUPs which encompass MZ I and II/VII, where those projects occur on BLM-administered lands and/or National Forest System decision area lands. For non-federal lands, reasonably foreseeable future projects may be subject to disturbance caps, buffer restrictions, and other requirements of Greater Sage-Grouse state plans, as well as site specific mitigation measures.

Regional efforts combined with the incremental effect of implementing the Proposed LUP Amendments would result in a net conservation gain for Greater Sage-Grouse habitats and populations in MZ II/VII. The Proposed LUP Amendments would meet the COT report objectives for fire, invasive plants, range management, recreation, pinyon-juniper expansion, infrastructure, energy, and mining by targeting these threats in the LUP Amendments and implementing management actions that specifically address these threats. Specifically, the following measures which would be implemented under the Proposed LUP Amendments, or are considered reasonably foreseeable future actions, would help meet the COT report objectives:

- Managing ROW exclusion and avoidance areas would help meet the COT report objective for infrastructure by limiting ROW/SUA development within PHMAs. These actions would also help to meet the COT objectives for non-native, invasive plant species by reducing disturbances that promote the spread of weeds.

- Designating major and moderate oil and gas stipulations would limit development in PHMAs, except where pre-existing valid rights apply. In these areas Conditions of Approval would limit disturbance.

- Implementation of state conservation plans and/or state executive orders would help meet all COT report objectives, particularly on non-BLM and non-National Forest System lands. Applying a 5% disturbance limit (under the Wyoming and Montana Greater Sage-Grouse plans/executive orders) would reduce impacts contributing to population declines and range erosion associated with multiple threats including energy, mining, and infrastructure.

- Prioritizing conifer treatments closest to occupied Greater Sage-Grouse habitats and near occupied leks, and where juniper encroachment is phase I or 2, would reduce the rate of conifer incursion and help to maintain healthy native sagebrush plant communities.

- Continued implementation of the Natural Resource Conservation Service Sage-Grouse Initiative would help meet the COT objective for the threat of agriculture conversion, by securing conservation easements on private lands. Fence marking, implementing prescribed grazing

systems, and vegetation seeding would help meet the COT objectives for range management structures, grazing, and non-native, invasive plant species.

Summary

The primary threats affecting Greater Sage-Grouse populations throughout MZ I and II/VII are energy development, infrastructure, grazing and free-roaming equids, weed spread, conversion to agriculture and urbanization, fire, recreation, and conifer spread (USFWS 2013).

Infrastructure and energy development are of particular concern in MZ II/VII because they affect the greatest land area. Numerous multi-state transmission lines are proposed through Greater Sage-Grouse habitat, as are large-scale oil and gas field developments in excess of 100,000 acres. Implementation of the Proposed LUPs in MZ II/VII is unlikely to preclude such projects from proceeding, especially Presidential priority transmission line projects that are not subject to Greater Sage-Grouse protective measures in the BLM and/or Forest Service Proposed LUPs; however, Greater Sage-Grouse protective measures are being considered in the project specific analysis. The cumulative effect of the conservation measures in the proposed LUP Amendments will result in protection of Greater Sage-Grouse populations. In some localized areas, small populations may be at continued risk due to the cumulative effect of reasonably foreseeable future infrastructure and energy development projects over the next 20 years, when combined with unplanned events such as wildfires, drought, or West Nile virus outbreaks. However, the LUP Amendments area-wide restrictions on land use, in combination with project-specific BMPs and RDFs and other regional efforts would achieve an overall net conservation gain for the regional population and would help mitigate the effects on small, at risk populations.

Private lands being converted to agriculture is also a particularly worrisome threat in MZ I. Tillage is increasing in Greater Sage-Grouse habitat because of the economic incentive of high crop prices and the patchwork pattern of landownership between federal and private lands that reduces habitat connectivity. Because widespread habitat fragmentation and degradation have already occurred in northeastern Wyoming, Greater Sage-Grouse in MZ I will depend on a combination of federal conservation actions and development restrictions, private conservation easements, and state disturbance limits to maintain viable habitat in PHMA and GHMA and to sustain Greater Sage-Grouse populations against present and widespread threats. Maintenance of habitat connectivity for sub-populations of Greater Sage-Grouse will protect against losses from disease and wildfire.

Implementation of the action alternatives including the Proposed LUP Amendments is anticipated to result in a net conservation gain for Greater Sage-Grouse habitats and populations in MZ I and II/VII. Alternatives B and C emphasize conservation of biological resources and contain more resource use restrictions than the other alternatives. Restrictions on BLM-administered lands and National Forest System lands could increase resource use pressure on private and state lands; however, the Wyoming and Montana executive (as discussed in Section 4.23.4) would help minimize this effect. While not as extensive, Alternative D includes Greater Sage-Grouse conservation measures and resource use allocations that would generally improve baseline conditions while exerting less development pressure on non-federal lands. However, Alternative D contains fewer protective measures compared to all other action alternatives (including the Proposed LUP Amendments). Net conservation gains would be concentrated outside of the Greater Sage-Grouse LUP Amendment planning area boundary where other Proposed LUPs would implement more protective LUPs. The Proposed LUP Amendments generally contain less restrictive Greater Sage-Grouse conservation measures compared to Alternatives B and C; however, these measures would improve baseline conditions for Greater Sage-Grouse and exert less development pressure on non-federal lands.

Although small fringe populations may be at continued risk of decline in the next 20 years, implementing Alternatives B, C, D, or the Proposed LUP Amendments, in combination with other regional efforts (such

as the Proposed LUPs for other BLM and/or Forest Service planning areas; conservation strategies in the Colorado, Idaho, Montana, Utah, and Wyoming state plans; increased land protections via NRCS SGI; and local habitat restoration efforts) would effectively conserve the region-wide Greater Sage-Grouse population in MZ I and II/VII.

4.23.9 MZ-Wide Reasonably Foreseeable Future Actions Summary Tables

Table 4-131 and Table 4-132 include a selection of some of the larger projects from the reasonably foreseeable future actions tables in the RMPAs/LUP Amendments for MZs I and II/VII. The full tables can be found in each EIS within each MZ.

Table 4-131. Reasonably Foreseeable Future Actions in Management Zone I Likely to Impact Greater Sage-Grouse Habitat

MZ	Planning Area	Greater Sage-Grouse Populatio n(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
Energy and Mining						
I	Buffalo	Powder River Basin, Wyoming Basin	Greater Crossbow Oil and Gas Exploration and Development Project	Campbell and Converse Counties, Wyoming	Proposed development of 1,500 new oil and gas wells over 110,000 acres of split estate mixed surface ownership lands. There are no BLM surface lands within the proposed development area; however, approximately 62% of the mineral estate is managed by the BLM.[1]	Proposed
I	Wyoming LUP Amend.	Powder River Basin, Wyoming Basin	Converse County Oil and Gas	Converse County, Wyoming	Proposed development of up to 5,000 new oil and gas wells in northern Converse County, Wyoming. The proposed development area encompasses roughly 1.5 million acres of split estate mixed surface ownership lands, and includes all or parts of three different Greater Sage-Grouse Core Areas.[2]	Proposed
I	Buffalo	Powder River Basin	Buffalo Oil and Gas Leases	Campbell, Johnson, Sheridan Counties, Wyoming	As of 2008, federal oil and gas leases covered approximately 2,533,975 acres in the Buffalo planning area.[3]	Ongoing
I	Miles City	Dakotas	Carter Master Leasing Plan (MLP)	Carter County, Montana	Proposed development of up to 119 oil and gas wells and associated infrastructure. 71% of oil and gas estate in MLP Area is comprised of federal mineral estate.[4]	Proposed

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
I	Miles City	Northern Montana, Yellowstone Watershed	Big Dry RMP Area	13 counties, northeast Montana	Surface coal leasing in the Fort Union Coal Region. 1,674,500 acres of high and moderate development potential (847,379 federal acres) in the RMP area.[5]	Ongoing
I	Miles City	Dakotas, Yellowstone Watershed, Powder River Basin	Surface coal leasing	Southeast Montana	Surface coal leasing in the Powder River Resource area. Lease proposals pending with the BLM comprise 2,242 acres and include the following mines: Spring Creek (1,772 acres), Rosebud (160) acres, Decker (310 acres).[3,6,7,8]	Ongoing and proposed
I	Buffalo	Powder River Basin	Powder River Basin Coal Mines	Campbell County, Wyoming	13 operating mines in the Buffalo planning area, and two proposed mines; all are surface coal mines, covering 162,336 federal acres in the Buffalo planning area.[6]	Ongoing and proposed
I	Miles City	Dakotas	Pending Bentonite expansion	Carter County, Montana	Increase in permitted area by 2,050 acres, of which, 1,649 acres would be federal (BLM-administered) and 401 acres would represent private ownership.	Proposed
I	Buffalo	Powder River Basin	Black Hills Bentonite (Mayoworth Area Mine and Peterson Draw/Willow Creek-Posey Creek/Tisdale-Wall Creek Areas Mine)	Johnson County, Wyoming	Currently, there are 2 authorized active open-pit bentonite mines, 1 mine pending authorization, and 47 active bentonite mining claims in the Buffalo planning area on federal lands (both federal surface/federal minerals and split estate).[8]	Ongoing and proposed
I	Buffalo	Powder River Basin	Nichols Ranch/Hank Unit Uranium in-situ Recovery Mining Project	Johnson County, and Campbell County, Wyoming	Pending authorization for a proposed 2,250-acre in-situ uranium recover mine, which includes 303 acres of BLM-administered surface lands. Seven occupied leks occur within 2 miles of the Hank Unit.[9]	Proposed
I	HiLine, Lewistown, Billings, Miles City, North Dakota, South Dakota	Northern Montana, Yellowstone Watershed, Belt Mountains, Powder River Basin, Dakotas	WAPA Upper Great Plains Wind Energy Programmatic EIS	Montana, North and South Dakota, other Great Plains states	Programmatic EIS will identify environmental impacts, mitigation strategies, and review procedures for future wind-energy proposals in the upper great plains region.[10]	Proposed

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
Rights-of-Way						
I	HiLine, Miles City, South Dakota	Northern Montana, Yellowstone Watershed, Dakotas	Keystone XL Pipeline	Montana, South Dakota, other states	285-mile ROW in Montana and South Dakota, of which 45 miles may occur on BLM-administered lands[11]	Proposed
I	Miles City	Yellowstone Watershed	Tongue River Railroad Project	Colstrip to Decker, Montana	Construction and operation of a 42-mile railroad between Miles City and Colstrip, Montana[12]	Proposed

[1]Greater Crossbow Oil and Gas EIS: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA.Par.24843.File.dat/hot_sheet.pdf
[2]Convers County Oil and Gas Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/cfo/Converse_County_Oil_and_Gas.html
[3]Buffalo Oil and Gas Leases: http://www.blm.gov/wy/st/en/programs/Planning/rmps/buffalo/docs.html
[4]Carter Master Leasing Plan – Miles City RFD. Minerals Appendix of Draft EIS. P. MIN-164-165: http://www.blm.gov/mt/st/en/fo/miles_city_field_office/rmp/draft_rmp.html
[5]Miles City RFD, Minerals Appendix of Draft EIS. P. MIN-165-173: http://www.blm.gov/mt/st/en/fo/miles_city_field_office/rmp/draft_rmp.html
[6]Powder River RMP Area – Miles City RFD, Minerals Appendix of Draft EIS. P. MIN-173-188, and Powder River Resource Area RMP (BLM 1984) (http://www.blm.gov/mt/st/en/prog/planning/powder_river.html)
[7]Spring Creek, Rosebud, Decker Mines – Miles City RFD, Minerals Appendix of Draft EIS. P. MIN-192
[8]Buffalo Revised Final Mineral Report: http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps/buffalo/docs.Par.90169.File.dat/RevisedFinalMineralReport_Part1.pdf.
[9]Nichols Ranch/Hank Unit Uranium in-situ Recovery Mining Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/bfo/nichols-ranch.html
[10]Upper Great Plains Wind Energy PEIS: http://plainswindeis.anl.gov/documents/dpeis/index.cfm.
[11]Keystone XL Pipeline: http://keystonepipeline-xl.state.gov/finalseis/index.htm
[12]Tongue River Railroad EIS: http://www.tonguerivereis.com

Table 4-132. Reasonably Foreseeable Future Actions in Management Zone II/VII Likely to Impact Greater Sage-Grouse Habitat

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
Energy and Mining						
II/ VII	Northwest Colorado, Wyoming LUP Amend.	Wyoming Basin, Northwest Colorado	Hiawatha Regional Energy Development EIS	Sweetwater County, Wyoming; Moffat County, Colorado	Proposed development of up to 4,208 new natural gas wells on approximately 157,361 acres of mixed federal, state, and private lands. The project area overlaps with lands identified as Greater Sage-Grouse Core Areas. 91% of the project area is managed by the BLM.[1]	Proposed

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
II/ VII	Wyoming LUP Amend.	Wyoming Basin	LaBarge Platform Exploration & Development Project	Lincoln and Sublette County, Wyoming	Proposed development of up to 838 new oil and gas wells on 218,000 acres of private, state, and federal lands. Approximately 154,000 acres of surface lands are administered by the BLM.[2]	Proposed
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Continental Divide-Creston Natural Gas Project	Carbon and Sweetwater Counties, Wyoming	Proposed development of up to 8,950 additional natural gas wells on 1.1 million acres of land, including Greater Sage-Grouse Core Areas. The proposed facilities would add to the existing network of wells, pipelines, access routes, and electrical distribution systems. Approximately 59% of the project area is on federally-owned lands.[3]	Proposed
II/ VII	Lander, Wyoming LUP Amend.	Wyoming Basin	Moneta Divide Natural Gas and Oil Development Project	Fremont and Natrona Counties, Wyoming	Proposed development of approximately 4,250 natural gas and oil wells on 265,000 acres of land (including approximately 169,500 acres of land administered by the BLM). The project area includes Greater Sage-Grouse Core Areas.[4]	Proposed
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Pinedale Anticline Project	Sublette County, Wyoming	Proposed development of natural gas resources within nearly 200,000 acres of land, of which approximately 80% is federal surface ownership. The project area occurs within Greater Sage-Grouse Core Areas.[5]	Ongoing
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Blacks Fork Project (Formerly Moxa Arch Area Infill)	Sweetwater, Uinta, and Lincoln Counties, Wyoming	Proposed infill drilling project, on approximately 7,500 hydrocarbon wells within 633,532 acres of mixed federal, state, and private lands.[6]	Proposed

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
II/ VII	Wyoming LUP Amend., Northwest Colorado, Utah	Wyoming Basin, Northwest Colorado	Oil Shale and Tar Sands Programmatic EIS	Colorado, Utah, and Wyoming	Amendment of 10 BLM RMPs to designate certain public lands as available for application for leasing and future exploration and development of oil shale and tar sands resources. A ROD was signed in 2013 which made approximately 678,000 acres available for potential development of soil shale, and approximately 132,000 acres available for development of tar sands.[7]	Ongoing
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Atlantic Rim Natural Gas Field Development Project	Carbon County, Wyoming	Ongoing development of oil gas resources on 270,080 acres of land, of which 173,672 are federal surface estate. A ROD was signed in 2007. The project area includes Greater Sage-Grouse Core Areas.[8]	Ongoing
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Chokecherry/ Sierra Madre Wind Farm	Carbon County, Wyoming	Proposed development of approximately 1,000 wind turbines and associated ancillary facilities on 220,000 acres of land. The project area includes private, state, and federally managed lands, and overlaps with Greater Sage-Grouse Core Areas.[9]	Proposed
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Normally-Pressured Lance Natural Gas EIS	Sublette County, Wyoming	Proposed development of approximately 3,500 natural gas wells within 141,000 acres of state, private, and BLM-administered lands.[14]	Proposed
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Bird Canyon Field Infill Project	Sublette and Lincoln Counties, Wyoming	Proposed drilling and production of 348 new natural gas wells within 17,612 acres of BLM-administered land.[15]	Proposed
Rights-of-way						
II/ VII	Wyoming LUP Amend., Northwest Colorado, Utah	Wyoming Basin, Rich-Summit-Morgan, Uintah, North Park, NWCO, Strawberry Valley, Carbon	Gateway South Transmission Line Project	17 Counties in Wyoming, Colorado, and Utah	Proposed 500 kV transmission line which would begin near Medicine Bow, Wyoming, and would extend south and west to a proposed substation near Mona, Utah. The proposed transmission line would span over 400 miles, with a 250-foot ROW, and would cross multiple land jurisdictions including lands administered by the BLM.[10]	Proposed

MZ	Planning Area	Greater Sage-Grouse Population(s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
II/ VII	Wyoming LUP Amend., Northwest Colorado, Utah	Wyoming Basin, Northwest Colorado, Sheeprock, Strawberry Valley, Carbon, Bald Hills.	TransWest Express Transmission Line Project	Wyoming, Colorado, Utah, and Nevada	Proposed 600 kV transmission line extending from south-central Wyoming to southern Nevada. The transmission line corridor would span over 700 miles and would cross private, state, and federally owned lands. The proposed route and alternative routes under consideration would cross priority and general habitats.[11]	Proposed
II/ VII	Wyoming LUP Amend., Idaho and Southwest Montana	Wyoming Basin, East Central, Northern Great Basin, Box Elder	Gateway West Transmission Line Project	Wyoming and Idaho	Proposed 230 kV and 500 kV transmission line project between Glenrock, Wyoming, and Melba, Idaho. Approximately 1,000 miles of new high-voltage transmission lines would be constructed. The project would cross multiple land jurisdictions, including sage-grouse Core Areas in Wyoming.[12]	Proposed
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Riley Ridge to Natrona Pipeline Project	Sublette, Sweetwater, Fremont, and Natrona Counties, Wyoming	Proposed 243-mile pipeline from Riley Ridge to Big Piney, Wyoming. The pipeline would consist of a 50-foot ROW, and would cross Greater Sage-Grouse Core Areas.[13]	Proposed
II/ VII	Wyoming LUP Amend.	Wyoming Basin	Zephyr Power Line Transmission Project	Wyoming, Colorado, Utah, and Nevada		Proposed
Weeds						
II/ VII	Wyoming LUP Amend., Northwest Colorado	Wyoming Basin, Northwest Colorado, Powder River Basin, North Park	Invasive Plant Management EIS for the Medicine Bow - Routt National Forests, and TBNG	Wyoming and Colorado	Proposed treatment of invasive plant species using adaptive and integrated invasive plant treatment methods. These include manual, mechanical, biological, aerial, and ground herbicide applications. Potential treatment areas include Greater Sage-Grouse Core Areas.[16]	Proposed

[1]Hiawatha Regional Energy Development Project Update: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/rsfodocs/hiawatha/newsltrs.Par.79506.File.dat/Hiawatha03-2013.pdf
[2]LaBarge Platform Exploration & Development Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/pfo/labarge_platform.html
[3]Continental Divide-Creston Natural Gas Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/cd_creston.html
[4]Moneta Divide Natural Gas and Oil Development Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/lfo/moneta-divide.html
[5]Pinedale Anticline Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/pfo/anticline/seis.html
[6]Black Forks Project (Formally Moxa Arch Area Infill Project) http://www.blm.gov/wy/st/en/info/NEPA/documents/kfo/moxa_arch.html
[7]Oil Shale and Tar Sands Programmatic EIS http://ostseis.anl.gov/
[8]Atlantic Rim Natural Gas Field Development Project http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/atlantic_rim.html

[9]Chokecherry/Sierra Madre Wind Farm: http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/Chokecherry.html
[10]Gateway South Transmission Line Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/hdd/gateway_south.html
[11]TransWest Express Transmission Line Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/hdd/transwest.html 12.
[12]Gateway West Transmission Line Project http://www.gatewaywestproject.com/
[13]Riley Ridge to Natrona Pipeline Project http://www.blm.gov/wy/st/en/info/NEPA/documents/rsfo/RRNP.html 14. Zephyr Powerline Transmission Project http://www.datcllc.com/datc-projects/zephyr/
[14]Normally Pressured Lance Natural Gas Development Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/pfo/npl.html
[15]Bird Canyon Natural Gas Infill Project: http://www.blm.gov/wy/st/en/info/NEPA/documents/rsfo/birdcanyon.html"
[16]Invasive Plant Management EIS for the Medicine Bow – Routt National Forests and Thunder Basin National Grasslands http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gDfxMDT8MwRydLA1cj72BTMwMTAwjQL8h2VAQArb-RA!!/?ss=110206&navtype=BROWSEBYSUBJECT&navid=130110000000000&pnavid=130000000000000&accessDB=true&position=Project*&groupid=19692&ttype=projectdetail&pname=Medicine%20Bow-Routt%20National%20Forests%20&%20Thunder%20Basin%20National%20Grassland-%20Projects

4.24 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA §102(2)C requires a discussion of any irreversible or irretrievable commitments of resources that would be involved in the proposal should it be implemented. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (e.g., extraction of any locatable mineral ore or fluid mineral). An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species or disturbance to protected cultural resources).

Implementation of the Wyoming Greater Sage-Grouse LUP Amendments would allow for surface disturbing activities, including mineral and energy development and infrastructure development that would result in irreversible or irretrievable commitments of resources. These surface disturbing activities would result in long-term or permanent alterations to soil, removal of vegetation cover, fragmentation of wildlife habitat, and damage to cultural and paleontological resources. Wildlife dependent on the affected habitats may be displaced and populations may be reduced as the carrying capacity of the range is reduced. Increases in sediment, salinity, and nonpoint source pollution that result from these activities could result in degradation of water quality and an irretrievable loss of water utility, aquatic habitats, and aquatic-dependent species. However, management prescriptions and mitigation prescribed under the alternatives that are designed to protect sage-grouse habitat and other sensitive resources would reduce the magnitude of these impacts by limiting surface disturbing and disruptive activities. Alternatives B and C would have the greatest reduction of impacts. Although reclamation of some disturbed sites would occur under all alternatives, the level of habitat diversity and quality that existed prior to disturbance may not be achieved for several decades. Surface disturbing activities could result in permanent impairment of wildlife habitat, water quality, and vegetation communities in some areas.

An irretrievable commitment of nonrenewable fossil fuels (i.e., oil and gas) would occur from the development of wells and subsequent extraction of fluid minerals over the next 20 years. The number of additional wells proposed for development within the planning area ranges from 1,567 to 897 depending on the alternative.

4.25 UNAVOIDABLE ADVERSE IMPACTS

NEPA §102(2)C requires disclosure of any adverse environmental effects that cannot be avoided should the LUP Amendments be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts would occur as a result of implementing the Wyoming Greater Sage-Grouse LUP Amendments.

Continuing to allow surface disturbing activities would result in unavoidable adverse impacts. Although these impacts would be mitigated to the extent possible, unavoidable damage is inevitable. Permanent conversion of vegetation resources to other uses, such as mineral and energy development reduces the quantity and quality of vegetation resources. Energy and mineral development activities on public lands create long-term visual intrusions, soil erosion and compaction, habitat degradation and fragmentation, and water quality impairment.

Development of the additional oil and gas wells would cause air quality related impacts. Under all alternatives, production and release into the atmosphere of HAPs, VOCs, CO, SO2, NOx, and PM10 would increase. However, it is not anticipated that the concentrations of these substances would increase to the point where an exceedance of the NAAQS or WAAQS would occur.

Because large portions of the big game habitats coincide with leased areas of oil and gas potential, impacts on wildlife habitat would be unavoidable. Although oil and gas well sites and their associated infrastructure would be mitigated to the extent possible, long-term and possibly permanent habitat degradation and displacement of wildlife populations would be unavoidable. In addition, competition is anticipated for forage resources among wildlife and livestock. The extent of these impacts would vary by location of development activities, season, and drought cycle.

Inadvertent damage and/or destruction of cultural and paleontological resources from increased surface-disturbing activities would be unavoidable. Although mitigation measures would include identification and mitigation of resources prior to surface disturbing activities, some unanticipated discoveries of unknown cultural and paleontological resources could occur. The number of sites anticipated to be inadvertently damaged is unknown.

Conflicts between user types such as recreationists who seek more primitive types of recreation and motorized users who share those recreational areas are unavoidable adverse impacts. As recreation demand increases, recreational use would disperse to other areas of the planning area, which could create conflicts with other existing uses of those areas. Recreation use would be displaced from areas of intense mineral development, which will increase the extent and frequency of conflict between these incompatible user groups in other areas.

Numerous land use restrictions imposed throughout the planning area to protect sage-grouse habitat and other sensitive resources would impact the ability of operators, individuals, and groups to use the public lands without limitations and result in forgone opportunities to use resources within the planning area. Although attempts would be made to minimize these impacts by limiting the level of protection necessary to accomplish management objectives and by providing alternative use areas for impacted activities, unavoidable adverse impacts would occur.

4.26 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA §102(C) requires discussion of the relationship between local, short-term uses of the human environment and the maintenance and enhancement of long-term productivity of resources.

Any use of the natural resources within the planning area is likely to adversely impact long-term productivity of these natural resources. The short-term uses that would result in the greatest impact on long-term productivity include mineral and energy development, dispersed recreation, livestock grazing, and infrastructure development. These uses result in surface disturbing and/or disruptive activities that remove vegetation, increase soil erosion and compaction, create visual intrusions and landscape alterations, increase noise, impair water quality, and degrade and fragment wildlife habitat. Although management actions, BMPs, surface use restrictions, and lease stipulations are intended to minimize the effect of short-term uses, some impact on long-term productivity of resources would occur regardless of management approach.

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