CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Chapter 4 presents the likely direct, indirect, and cumulative impacts on the human and natural environments in terms of environmental, social, and economic consequences projected to occur when the alternatives presented in Chapter 2 are implemented. Because the alternatives generally describe overall management emphasis, the environmental consequences are most often expressed in comparative general terms.

Impact analyses and conclusions are based on the interdisciplinary team's knowledge of the resources and planning area, information provided by Bureau of Land Management (BLM) experts or those from other agencies, and information contained in pertinent existing literature. The current condition or situation as described in Chapter 3, *Affected Environment* was the baseline used for the impact analysis. Analysis assumptions have also been developed to help guide the determination of impacts (see *Analytical Assumptions*). Because this resource management plan (RMP) provides a broad management framework and because exact locations of development or management are often unknown, the analysis in this chapter represents best estimates of impacts. Impacts are quantified to the greatest extent practical with available data. In the absence of quantitative data, best professional judgment provides the basis for the impact analysis.

Inconsistent management between local government growth policy plans and the RMP are found in Chapter 5 "Consistency" section.

MITIGATION

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, in addition to BLM management actions. In undertaking BLM management actions, and consistent with valid existing rights and applicable law, in authorizing third party actions that result in habitat loss and degradation, the BLM will require mitigation that provides a net conservation gain to the species including accounting for any uncertainty associated with the effectiveness of such mitigation. This will be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions. In addition, to help implement this Proposed Plan a WAFWA Management Zone Regional Mitigation Strategy (per the *GRSG Regional Mitigation Strategy Appendix*) will be developed within one year of the issuance of the Record of Decision. The Strategy will elaborate on the components identified in Chapter 2 (avoidance, minimization, compensation, additionality, timeliness, and durability), and will be considered by the BLM for BLM 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.

AVAILABILITY OF DATA AND INCOMPLETE INFORMATION

Although programmatic planning efforts typically utilize site-specific data to the extent possible, site-specific data is not always available. Some information was unavailable for use in developing the RMP, primarily because resource-specific inventories have not been conducted or completed. Data unavailable for development of this RMP included:

- regional oil and gas emission inventories appropriate for photochemical grid modeling,
- certain cultural surveys,
- planning-area-wide vegetation by species,
- detailed soil surveys for lands,

- certain wildlife inventory data (e.g., peregrine falcon nest sites or other sites),
- wildlife monitoring data,
- 100-year floodplain mapping,
- certain American Indian traditional use areas,
- detailed climate change impact data at the local level, and
- visitor use trend data for recreational areas.

As a result, some impacts could not be quantified in relationship to the proposed management actions. Where data is insufficient to quantify the potential impacts, the impacts are projected in qualitative terms or, in some cases, described as unknown. Subsequent project-level analysis of impacts would provide the opportunity to collect and examine site-specific inventory data necessary to determine appropriate application of the RMP programmatic level guidance. Ongoing inventory efforts by the BLM and other agencies within the planning area would be used to continually update and refine the information used to implement this plan.

ANALYTICAL ASSUMPTIONS

To estimate the impacts of the alternatives, several assumptions are made (see *Disturbance Appendix*). These are made only for the purpose of analysis and do not represent potential RMP decisions; however, the assumptions do provide reasonably foreseeable, projected levels of development that could occur within the planning area. These assumptions should not be interpreted to be constraining or redefining Chapter 2 management objectives and actions proposed for each alternative. The following are the general assumptions applicable to all resource categories. Specific resource assumptions are provided in the subheading for that resource.

- Decisions and implementation of actions from any of the RMP alternatives would be in compliance with all valid existing rights, federal regulations, Bureau policies, and other requirements.
- Acre figures and other numbers used in the analysis are approximate projections for comparison and analytical purposes only. Readers should not infer that they reflect exact measurements or precise calculations.

Throughout the planning area, BLM-authorized activities associated with all resource and all resource use programs would be subject to mitigation and minimization guidelines and best management practices (BMPs) (see the *Mitigation Measures and Conservation Actions Appendix*) including those specific *Mitigation Measures, Conservation Actions, and Best Management Practices* for greater sage-grouse (see the *Mitigation Measures, Conservation Actions, and Best Management Practices Appendix*). For analysis purposes, it has been assumed that these measures and conservation actions would be implemented during site-specific project planning, where appropriate.

TYPES OF IMPACTS

DIRECT AND INDIRECT

Consistent with direction provided in 40 Code of Federal Regulations (CFR) 1502.16, direct, indirect, and cumulative impacts were considered in this impact analysis. Direct impacts are caused by implementation of an action or alternative and occur at the same time and place. Indirect impacts also result from implementation of an action or alternative but usually occur later in time or further removed in distance. Indirect impacts are reasonably certain to occur.

Impacts were quantified, where possible, primarily using geographic information systems (GIS) applications. In the absence of quantitative data, best professional judgment prevailed; subsequently, impacts are sometimes described using ranges of potential impacts or qualitative terms.

Only management programs with impacts were included in Chapter 4. The standard definitions for terms referring to impact duration used in the impact analysis are as described below, unless otherwise stated.

- Short-term impact: The impact occurs only during implementation or immediately after implementation of the alternative. For the purposes of this RMP, short-term impacts would occur during the first 5 years.
- Long-term impact: The impact could occur for an extended period after implementing the alternative. The impact could last several years or more and could be beneficial or adverse. For the purposes of this RMP, long-term impacts would occur beyond the first 5 years.

CUMULATIVE IMPACTS

Cumulative impacts are defined as the direct and indirect impacts of a proposed project alternative's incremental impacts in combination with other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR Part 1508.7). Guidance for implementing the National Environmental Policy Act (NEPA) requires that federal agencies identify the timeframe and geographic boundaries within which they would evaluate potential cumulative impacts of an action and the specific past, present, and reasonably foreseeable projects that would be analyzed. Impacts 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 BLM-administered lands.

Actions anticipated over the next 20 years on all lands in the planning area, including those with private, state (Montana Fish, Wildlife, and Parks [MFWP] and the Montana Department of Natural Resources and Conservation [MDNRC]), and federal (United States Forest Service [USFS], Bureau of Reclamation, National Park Service, and the United States Fish and Wildlife Service [USFWS]) ownership or administration, have been considered in the analysis to the extent reasonable and possible, by resource and program area. The analysis remains general because decisions about other actions in the planning area could be made by many other public and private entities, and the location, timing, and magnitude of such actions cannot be predicted. Actions outside of the BLM's jurisdiction considered in the cumulative impacts analysis include:

- those pertaining to the Tongue River Railroad Project (near Colstrip and Decker, Montana);
- an increase in the number of conservation easements within the planning area to prevent subdivisions and development;
- increased purchase or operation of private land for purposes other than commodity production (including recreational, philosophical, and quality of life values);
- continued vegetation manipulation on private lands, which might lead to a decrease in sagebrush canopy;
- continued timber harvest on MDNRC lands;
- the continuation and maintenance of commercial saw log harvest by the USFS;
- the increased use of prescribed and natural ignition fires by the USFS;
- the expectation that large-scale, stand-replacing wildfires would be expected to cross into lands under the jurisdiction of the Miles City Field Office (MCFO);
- the continuation of livestock and wildlife grazing on state lands;
- increased use of communication sites and corridors;
- continued development of unincorporated areas;
- continued county maintenance of roads under the jurisdiction of counties within the RMP area;
- those pertaining to the Nelson Creek Project (near Circle, Montana, in McCone County) 500-megawatt, lignite-burning, coal-fired power plant;
- an increased number of concentrated animal feeding operations;
- an annual average of 96 wildfires that burn an average of 43,240 acres on BLM-administered, USFS, USFWS, and state and private lands in the Eastern Montana Fire Zone. (based on 21-year average from January 1, 1991 to December 31, 2011, WFMI).
- increasingly consolidated private land holdings to form larger private land ownership holdings;
- an increase in private lands leased for outfitted hunting opportunities, resulting in more pressure to BLM-administered lands;

- the continuation of increased demands for energy (oil, gas, coal, and alternative sources such as wind) on federal, state, and private mineral estate; and
- continued alteration of hydrologic function on and off public lands due to reservoir and pit construction and implementation or continuation of fish passage projects to restore historic migratory patterns on the Tongue and Yellowstone rivers and important tributary streams.

Chapter 4, *Environmental Consequences*, contains a description of potential impacts to existing biological and physical resources of the planning area and follows the order of topics addressed in Chapter 2.

For a description of the impacts from management actions in Chapter 2, see below or, for electronic drafts, click on the following link to take you to a specific resource:

RESOURCES: Air Resources and Climate; Cultural Resources; Fish and Wildlife (Aquatics, including Special Status Species); Invasive Species; Lands with Wilderness Characteristics; Paleontological Resources; Prescribed Fire and Fuels Management; Riparian and Wetland Areas; Soils; Vegetation; Visual Resources; Water Resources; and Wildland Fire Management and Ecology.

RESOURCE USES: Coal; Forestry and Woodland Products; Lands and Realty; Livestock Grazing; Mineral; Recreation; SRMAs; Renewable Energy; Travel Management and Off-highway Vehicle Use;

SPECIAL DESIGNATION AREAS: Back Country Byways; National Trails; Special Designation Areas; Wilderness

SOCIAL AND ECONOMIC: Economic; Environmental Justice; Hazardous Materials and Waste; Social

RESOURCES

AIR RESOURCES AND CLIMATE

ASSUMPTIONS AND METHODOLOGY

The air resources impact analysis includes emission inventories for each alternative, quantitative analysis for near-field air resource impacts from oil and gas activity, and qualitative descriptions of potential far-field impacts to air pollutant concentrations and air quality related values (AQRV), including visibility and deposition.

Emission inventories include BLM sources and non-BLM sources within the planning area. Criteria pollutants include carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3), fine particulate matter ($PM_{2.5}$), particulate matter (PM_{10}), and sulfur dioxide (SO_2), as well as volatile organic compounds (VOCs), which are ozone precursors. Hazardous air pollutants (HAPs), such as benzene and toluene, are also included in the inventories. Lead emissions were not estimated because there are few lead-emitting sources in the planning area. As described in Chapter 3, *Affected Environment*, ozone is not emitted directly into the atmosphere; instead, it is formed in atmospheric reactions involving nitrogen oxides and VOCs. Emissions of greenhouse gases (GHGs) (carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O]) are described in the climate change impact analysis. An emissions inventory was completed for the planning area and is included in the *Miles City Field Office Resource Management Plan Air Resource Technical Support Document* (BLM 2014).

Proposed management activities would cause GHG emission increases from many types of sources. This section quantifies GHG emissions from each alternative and provides a qualitative discussion of potential climate impacts. As described in Chapter 3, *Affected Environment*, climate change is occurring and will continue to occur for many years because of the longevity of GHGs that are already in the atmosphere. Approximate atmospheric lifetimes for carbon dioxide, methane, and nitrous oxide are 50 to 200 years, 12

years, and 120 years, respectively (USEPA 2010i). Consequently, GHG emissions would cause long-term climate change impacts.

Ongoing scientific research has identified the potential impacts of GHG emissions on climate change. Through complex interactions at regional and global scales, atmospheric GHG concentrations cause a net warming of the atmosphere (which makes surface temperatures suitable for life on Earth), primarily by decreasing the amount of heat energy Earth radiates back into space. Although GHG concentrations in the atmosphere and climatic conditions have varied throughout Earth's history, industrialization and combustion of fossil fuels have caused global atmospheric carbon dioxide concentration to increase dramatically (NRC 2006). Global atmospheric concentrations of carbon dioxide were expected to increase from 385 parts per million (ppm) in 2008 to more than 400 ppm by 2020 and could plateau at 450 ppm if emissions are stabilized at current or reduced levels (Karl, Melillo, and Peterson 2009). The carbon dioxide concentration monitored at the Manua Loa Observatory exceeded 400 ppm for the first time in May 2013.

The global increase in carbon dioxide concentrations is due primarily to fossil fuel use and land use change, while those of methane and nitrous oxide are due to agricultural soil management, animal manure management, sewage treatment, and mobile and stationary combustion of fossil fuels (IPCC 2007). According to climate change researchers, the impacts of climate change are expected to vary by region, season, and time of day (NRC 2006; Karl et al. 2009). Computer model forecasts indicate that increases in temperature will not be evenly or equally distributed but are likely to be accentuated at higher latitudes.

The lack of scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change at local scales limits the ability to quantify many future impacts of climate change in the planning area. The following paragraphs describe potential future impacts of climate change that can be reasonably anticipated for the region; some of these impacts are known to already be occurring. However, over the next 20 years, tools may become available that will allow for better local analysis of climate change impacts and for better capability to predict carbon storage. The United States Geological Survey (USGS), for example, is developing GIS-based tools to determine the carbon storage of specific soils. Ongoing research is analyzing the response of different vegetation types to increasing carbon dioxide, longer growing seasons, higher heat, and more unpredictable rain patterns.

The Earth's atmosphere is warming and these warming trends are expected to continue through the life of this plan. Climate changes predicted for the region include the changes described below.

- Surface temperature: average annual temperatures may increase 3 to 5 degrees (°) Fahrenheit (F) from the 1960 to 1979 baseline years by the mid-21st century (Karl et al. 2009). The largest increase in average temperature is likely to occur in the winter months. Relatively cold days in the region are becoming less frequent and relatively hot days are becoming more frequent (Karl et al. 2009).
- Precipitation: regional precipitation is expected to increase during winter and spring, decrease during summer, and remain relatively stable during fall (Karl et al. 2009).

Within North America, warming is predicted to affect many resources and human health. In western mountain areas, warming is projected to cause decreased snowpack, more winter flooding, and reduced summer river and stream flows, which would exacerbate competition for water resources and could cause declining water quality. The warming of lakes and rivers would adversely affect the thermal structure and water quality of hydrological systems, which would add additional stress to water resources in the region (IPCC 2007). The region depends on springtime snowpack to meet demand for water from municipal, industrial, agricultural, recreational uses, and BLM-authorized activities. The USGS notes that mountain ecosystems in the western United States are particularly sensitive to climate change, particularly in the higher elevations, where much of the snowpack occurs. Some of these areas have experienced three times the global average temperature increase over the past century (USGS 2010a). Higher temperatures are also causing more winter precipitation to fall as rain rather than snow, which would contribute to earlier snowmelt. Additional declines in snowmelt associated with climate change are projected, which would reduce the amount of water available during summer (Karl et al. 2009). Rapid spring snowmelt resulting from sudden and unseasonal temperature increases could also lead to greater erosive events and unstable soil conditions.

Increasing temperatures could also increase the amount of water vapor in the atmosphere, the timing and amount of precipitation, and the intensity of storm systems. Climate models predict continued increases in the heaviest rainfall events, while the lightest precipitation is predicted to decrease. Heavy downpours that are now 1-in-20-year occurrences are predicted to occur approximately every 4 to 15 years by the end of this century, depending on location, and the intensity of heavy downpours is also expected to increase.

There is evidence that recent warming is affecting aquatic biological systems (IPCC 2007). Increases in algal abundance in high-altitude lakes have been linked to warmer temperatures, while range changes and earlier fish migrations in rivers have also been observed (IPCC 2007). Increased temperatures would raise water temperatures in lakes, reservoirs, rivers, and streams. Fish populations are expected to decline due to warmer waters, which could lead to the closure of fishing waters (Saunders, Montgomery, Easley, and Spencer 2008).

Climate change is likely to combine with other human-induced stress to further increase the vulnerability of ecosystems to pests, invasive species, and loss of native species. Warming temperatures are leading to earlier timing of spring events such as leaf-unfolding, bird migration, and egg-laying (IPCC 2007). The range of many plant and animal species is shifting north and to higher elevations, as the climate of these species' traditional habitat changes (Lawler et al. 2009). Warming temperatures are also linked to longer thermal growing seasons (IPCC 2007). Climate change is likely to affect wildlife breeding patterns, water and food supply, and habitat availability to some degree. Sensitive species in the planning area, 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.

Increases in average summer temperatures and earlier spring snowmelt in the region are expected to increase the risk of wildfires by increasing summer moisture deficits (Karl et al. 2009). Studies have shown that earlier snowmelts can lead to a longer dry season, which increases the incidence of landscape-level fire (Westerling, Hidalgo, Cayan, and Swetnam 2006b). Together with historic changes in land use, climate change is anticipated to affect the variability in the occurrence of wildfire throughout the western United States. Although the impact of climatic factors varies by ecosystem type and from year to year, drought, low winter precipitation, wind conditions, and high summer temperatures are positively associated with wildfire occurrence (Ashton 2010). During the last 20 years, research has shown that these factors have led to an increase in the frequency of very large wildfires and total acres burned throughout the region (Ashton 2010).

Climate change also poses challenges for many resource uses on BLM-administered land. Increased temperatures, drought, and evaporation may reduce seasonal water supplies for livestock and could impact forage availability. However, in non-drought years, longer growing seasons resulting from thermal increases may increase forage availability throughout the year. In the next few decades, moderate climate change is projected to increase aggregate yields of rain-fed agriculture by 5 to 20 percent, but with important variability among regions (NRC 2011). Major challenges are projected for crops that are near the warm end of their suitable range or which depend on highly utilized water resources. Shifts in wildlife habitat due to climate change may influence hunting and fishing activities, and early snowmelt may impact winter and water-based recreational activities. Drought and resulting stress on vegetation could increase the frequency and intensity of mountain bark beetle and other insect infestations.

Climate change science and predictions of climate change impacts are a continually growing and emerging science. Additional and recent information on climate change and regional predictions can be found at the United States Global Change Research Program (http://www.globalchange.gov/) and the Intergovernmental Panel on Climate Change (http://www.ipcc.ch/).

IMPACTS COMMON TO ALL ALTERNATIVES

BLM emission sources include fluid mineral development (conventional natural gas, CBNG, and oil), solid mineral development (primarily coal), fuels management (prescribed fire, mechanical vegetation treatment), resource road maintenance, forest and woodland treatments, livestock grazing, vegetation management, recreation, and general BLM travel. These emissions would be long-term emissions because most activities would be expected to occur over the life of the plan. However, if activities ceased, concentrations of criteria air pollutants and HAPs would decrease through emission reductions. In this respect, air resource impacts would be

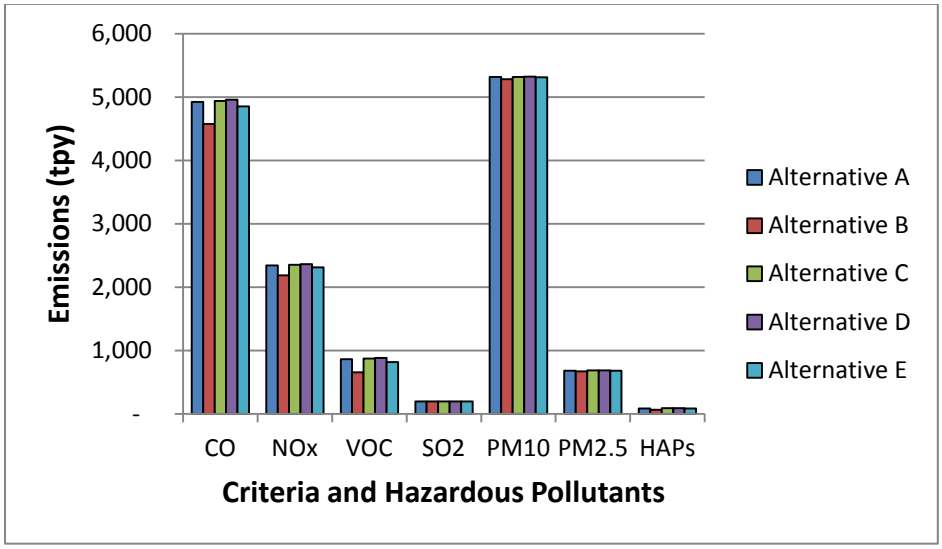
short-term, reversible impacts. Estimates of BLM-authorized emissions of criteria pollutants and HAPs are shown in Figure 4-1.

For the preferred alternatives, the largest BLM criteria pollutant and HAP emission sources would be associated with coal mining, fluid mineral development, fire management, livestock grazing, and trails and travel management. Detailed emission breakdowns by resource are included for each of the alternatives. For most of these resources, emissions would be similar to emissions associated with current levels of activity. For example, forestry management and general BLM travel would not be expected to increase over current activity levels and emissions from these activities would remain relatively constant. Consequently, emissions from these ongoing resource management activities would not represent increases to regional emissions. However, oil and gas activity emissions would reflect increased activity in future years and would add to regional emissions. Oil and gas emission estimates reflect the year with the greatest total emissions from development and production activities.

Oil and gas emission inventories are generally based on emission standards required by the Montana Department of Environmental Quality (MDEQ) and United States Environmental Protection Agency (USEPA). An exception is emission estimates based on the use of Tier 4 non-road engine standards for diesel drill rig engines, which would be required under BMPs and as an initial mitigation measure, unless future modeling or monitoring demonstrates that non-Tier 4 engines are predicted to comply with the NAAQS. A list of initial mitigation measures to be applied upon issuance of the ROD is included in the air resource management plan (ARMP) provided in the *Air Resources and Climate Appendix*. For drill rig and completion engines greater than 750 horsepower, generator set engines with low emission rates were assumed when developing the emission inventories.

With regard to other oil and gas emission sources, emissions were estimated conservatively because they do not account for the use of newer, cleaner non-drill-rig engines that will replace older engines.

FIGURE 4-1.
CRITERIA AND HAZARDOUS AIR POLLUTANT EMISSIONS FROM BLM SOURCES IN THE PLANNING AREA



Criteria pollutant emissions associated with management actions included in this RMP would be between 1.1 percent and 21.8 percent of total emissions in the planning area (Carter, Custer, Daniels, Dawson, Fallon, Garfield, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Treasure, and Wibaux counties). Although National Emission Inventory emissions include stationary sources, non-road sources, and vehicle sources, National Emission Inventory emissions do not necessarily include all existing oil and gas emissions since some small sources and many fugitive emissions have not been included historically. The oil and gas activity emissions represent a potential increase in county emissions because these emissions are associated with additional

authorized activity. Emission increases associated with future oil and gas activity vary from less than 0.01 percent to 10.6 percent of National Emission Inventory emissions.

Near-field Criteria Air Pollutant Concentrations from Oil and Gas Activities

Near-field dispersion modeling was performed for oil and gas development for drilling and completion of wells, in addition to well pad construction activities. The USEPA guideline model for estimating near-field impacts is the AERMOD dispersion model. AERMOD is suitable for modeling discrete sources of emissions to a distance of 50 kilometers from the source, and provides conservative estimates of potential air quality impacts from such sources. Receptors were placed in the modeling domain, which extended 3 kilometers from the center of the central well pad. Information describing AERMOD meteorology, modeling parameters, and data processing is provided in the *Near-Field Air Quality Assessment Protocol for Resource Management Plans and Environmental Impact Statements: Billings Field Office, HiLine District, Miles City Field Office, South Dakota Field Office* (BLM 2012c). Emission inventories for each alternative and detailed near-field modeling results are provided in the *Miles City Field Office Air Resource Technical Support Document* (BLM 2014) and summarized below. Emissions associated with each of the alternatives represent a fraction of the USEPA's National Emission Inventory emissions reported for calendar year 2008 (Table 4-1).

Three well pad development scenarios (construction, drilling, and completion) were modeled at a central well pad. Well development activities would be temporary and occur at different times. Well pad construction would occur first over a period of up to 3 days of active site construction involving soil movement (e.g., digging and grading). Drilling would occur next, with up to 15 days of active drilling. Then well completion would occur for up to 5 days. Once well development is complete, a long-term production phase typically begins. The construction modeling scenario has the greatest short-term (24-hour) emission rates for particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). Temporary drilling activities account for the greatest short-term (1-hour) emission rates for all non-particulate criteria air pollutants. Completion activities have greater non-particulate emissions than the construction phase. In order to represent production activities at nearby wells, estimated oil and gas production emissions were modeled at four producing wells surrounding the central pad. Production emissions at outlying pads were modeled concurrently with each of the three well development scenarios (construction, drilling, and completion).

TABLE 4-1.
ESTIMATED MAXIMUM ANNUAL CRITERIA POLLUTANT EMISSIONS AS A PERCENTAGE OF EXISTING EMISSIONS

Alternative	**Percentage of Total Emissions Within Planning Area Counties (%)** [1]					
	CO	**NOx**	**VOC**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Alternative Emissions for Multi-Resource Activities Excluding Wildfire Smoke [2, 3]						
A	14.6	6.0	15.1	1.1	21.7	18.1
B	13.6	5.6	11.5	1.1	21.6	17.8
C	14.7	6.0	15.3	1.1	21.7	18.1
D	14.7	6.1	15.5	1.1	21.8	18.1
E	14.4	5.9	14.3	1.2	21.7	18.0
Increase Due to Oil and Gas Activity Emissions (%) [4]						
A	2.9	1.2	10.2	<0.01	0.4	0.8
B	1.9	0.7	6.6	<0.01	0.2	0.5
C	3.0	1.2	10.4	<0.01	0.4	0.8
D	3.0	1.2	10.6	<0.01	0.4	0.8
E	2.7	1.1	9.4	0.02	0.4	0.7

[1] Counties included in the National Emission Inventory comparison include Carter, Custer, Daniels, Dawson, Fallon, Garfield, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Treasure, and Wibaux counties.
[2] Wildfire smoke is excluded since it is caused by natural events and is not included as part of the National Emission Inventory.
[3] A large share of these emissions are from activities that are already occurring; therefore, they do not necessarily represent an increase in emissions over current emission inventories.
[4] Oil and gas emissions represent an increase above National Emission Inventory emissions because they are associated with new well development and production.

Modeled concentrations were compared to National Ambient Air Quality Standards (NAAQS), Montana Ambient Air Quality Standards (MAAQS), and Prevention of Significant Deterioration (PSD) increments. Comparisons to the NAAQS and MAAQS were performed by summing modeled concentrations with background concentrations (representing current air quality) and comparing the total concentrations to the standards. Initial modeling using emission estimates based on Tier 2 drill rig engines, predicted nitrogen dioxide (NO_2) concentrations that exceeded the 1-hour NO_2 standard. The model was re-run using a revised emission inventory reflecting Tier 4 drill rig engines.

The results of the final near-field modeling performed for Alternative A are shown in Table 4-3. Alternative A near-field modeling represents dense well pad and equipment spacing that could occur in localized areas within high potential oil and gas activity areas; because this dense spacing could also occur under Alternatives B, C, D, and E, the Alternative A modeling results conservatively predict impacts that could occur in localized areas under each of the alternatives.

Table 4-2 summarizes modeled results by showing the largest modeled and total concentrations based on the three scenarios and 5 years (2005 through 2009) of meteorological data. Additional modeling results are included in the air resource technical support document (BLM 2014). For example, the maximum total 1-hour carbon monoxide concentration of 7,534 micrograms per cubic meter (µg/m3) was predicted during the drilling scenario using 2009 meteorology. Predicted concentrations were below the NAAQS and MAAQS, as shown by the percentages in the last column of the table. Total concentrations of 50 percent of a NAAQS or greater were predicted for the 1-hour nitrogen dioxide (NO_2), 24-hour particulate matter (PM_{10}), and 24-hour fine particulate matter ($PM_{2.5}$) standards. The maximum 1-hour nitrogen dioxide impacts were due to heavy-duty construction equipment exhaust during the brief well construction period. Maximum 24-hour particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) impacts occurred during short-term construction-related activities. Predicted ambient concentrations associated with production activities were much less than emissions associated with temporary activities.

TABLE 4-2.
NEAR-FIELD NAAQS MODELING SUMMARY FOR ALL ALTERNATIVES

Pollut.	Avg. Period	Model Output Rank	Value (µg/m³)						Percentage of NAAQS (%)
			Modeled Conc.	PSD Increment		Bckgrnd Conc.[1]	Total Conc.	NAAQS or MAAQS	
				Class I	Class II				
CO	1-hour	H2H	321	None	None	7,213	7,534	26,450[6]	28
	8-hour	H2H	231	None	None	2,175	2,406	10,000	24
NO_2	1-hour	H8H [2]	89.7	None	None	40	129.7	188	69
	Annual	H1H [3]	2.8E-02	2.5	25	6	6.28	94[6]	7
PM_{10}	24-hour	H2H	108.0	8	30	30	138.0	150	92
	Annual	H1H	0.6	4	17	8	8.6	50[6]	17
$PM_{2.5}$	24-hour	H8H [4] (H2H)[7]	9.2	2	9	22.5	31.7	35	91
	Annual	H1H	0.86	1	4	5.5	6.36	15	42
SO_2	1-hour	H4H[5]	3.3	None	None	35	38.3	196	20
	3-hour	H2H	2.32	None	None	35	37.3	1300	3
	24-hour	H2H[3]	0.58	5	91	11	11.58	365[6]	4
	Annual	H1H[2]	1.12E-03	2	20	3	3.00	80[6]	6

H1H = highest-first-high; H2H = highest-second-high; H4H = highest-fourth-high; H8H = highest-eighth-high
[1] Background concentrations were provided by the MDEQ (MDEQ 2012a; MDEQ 2012b).
[2] 5-year average of the 98th percentile (H8H) 1-hour modeled NO_2 concentrations. Post processed using the 1-hour and annual NO_2 Tier 2 method using 80 percent conversion of modeled NO_x to NO_2.
[3] Post processed using the annual NO_2 Tier 2 method using 75 percent conversion of modeled NO_x to NO_2.
[4] 5-year average of the 98th percentile (H8H) 24-hour modeled $PM_{2.5}$ concentrations.
[5] 5-year average of the 99th percentile (H4H) 1-hour modeled SO_2 concentrations.
[6] This is a Montana standard.
[7] The H2H rank provided in parentheses is used to compare to the PSD increments, while the H8H rank is compared to the NAAQS.

Modeled concentrations can also be compared to PSD increments, which are designed to prevent good air quality from deteriorating to the level, set by the NAAQS. In areas attaining the NAAQS, PSD increment analysis is required prior to construction of a major stationary source of air pollutants that have the potential to emit at least 100 tons per year (tpy) or 250 tpy of a criteria air pollutant. The sources included in this near-field modeling analysis do not meet the definition of a major source of criteria air pollutants and would not be required to undergo PSD analysis. The following PSD analysis is not a regulatory analysis; its purpose is to provide context for evaluating potential air quality impacts.

The USEPA established PSD increments for Class I areas (e.g., national parks and large wilderness areas) and Class II areas (all non-Class I areas). Oil and gas activities are expected to occur within Class II areas and the modeled (not total) concentration can be compared directly to the Class II increment. Temporary 24-hr particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) concentrations greater than the Class II PSD increments are predicted to occur during construction and completion activities. Temporary concentrations above the Class I increments for particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) are also possible during construction, drilling, and completion if these activities were located very close to a Class I area.

Air pollutant concentrations generally decrease as distance from the source increases. Figure 4-2 provides an illustration of 24-hr particulate matter (PM_{10}) modeled concentrations during construction activity. At the center of the figure is a well pad with short-term construction activities. The four surrounding well pads are modeled with emissions representing production activity. Red markers indicate emission sources and green markers indicate receptors (points at which concentrations are calculated). Shaded areas indicate the extent of the area for which particulate matter (PM_{10}) concentrations are predicted to be greater than the PSD Class I increment (8 $\mu g/m^3$) or Class II increment (30 $\mu g/m^3$) on the day with the second-highest particulate matter (PM_{10}) modeled concentration during 2005. Wells would be located in Class II areas and concentrations above the Class II PSD increment are predicted to extend up to approximately 300 meters from the well pad boundary. In order for concentrations to exceed the Class I increment, well pad construction activity would need to be within approximately 1,500 meters of a Class I area. Concentrations of these magnitudes could occur only on days when well pad construction activity is concurrent with meteorological conditions causing high ambient particulate matter (PM_{10}) concentrations.

Near-field Hazardous Air Pollutant Concentrations from Oil and Gas Activities

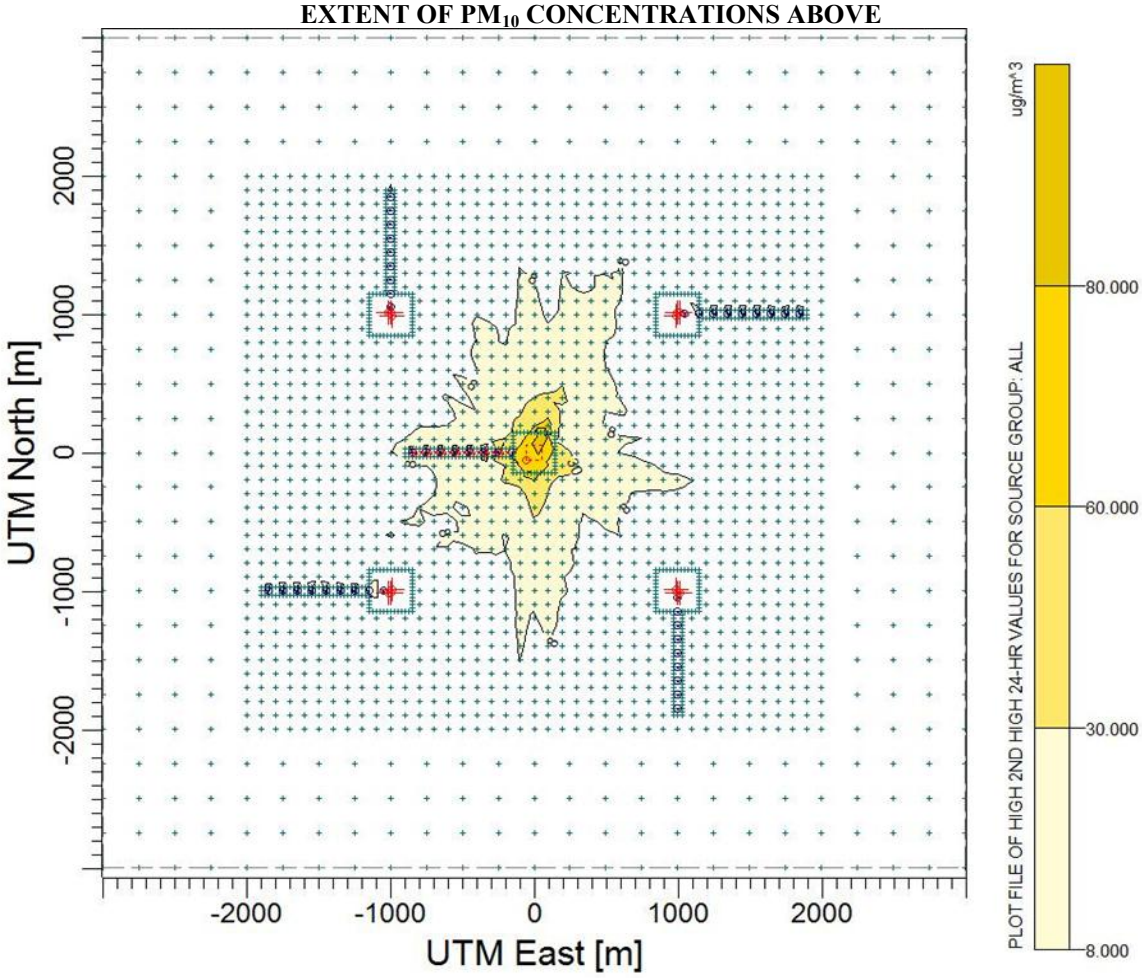
Near-field modeling was also conducted to determine predicted ambient air quality impacts of HAP emissions. HAPs are defined by the USEPA as toxic air pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects, birth defects, or adverse environmental effects. Similar to the NAAQS modeling, HAP modeling consisted of construction, drilling, and completion of wells. Modeled impacts were compared to established health-based thresholds to determine the incremental increase in risk associated with the proposed activities. Health-based thresholds are established for both short-term (acute, typically 1-hour) and long-term (chronic, 1-year) exposures. The short-term thresholds used in the analysis consisted of acute reference exposure levels and are defined as short-term concentrations at or below which no adverse health effects would be expected. The long-term non-carcinogenic thresholds used in the analysis consisted of chronic reference concentrations and are the threshold at which no long-term, non-carcinogenic adverse health effects would be expected. The long-term carcinogenic thresholds used in the analysis consisted of unit risk factors to estimate the increased risk of developing cancer associated with the ambient concentration of the HAP being analyzed. Six HAPs were modeled (benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene) (Table 4-3).

To estimate the incremental increase in risk, the modeled impacts were compared directly to reference exposure levels. Table 4-4 presents the results of the acute HAP modeling. The maximum acute impacts for benzene, formaldehyde, n-hexane, toluene, and xylene were associated with drilling operations. The maximum impacts for ethyl benzene were associated with well completions. Acute HAP modeling impacts were well below the reference exposure levels. Table 4-5 presents the results of HAP modeling of potential chronic effects and compares them to reference concentrations.

TABLE 4-3.
HEALTH EFFECTS OF MODELED HAZARDOUS AIR POLLUTANTS

HAP	Short-term (Acute)	Long-term (Non-carcinogen)	Long-term (Carcinogen)
Benzene	X	X	X
Ethyl Benzene	X	X	X
Formaldehyde	X	X	X
N-Hexane	X	X	
Toluene	X	X	
Xylene	X	X	

FIGURE 4-2.
EXTENT OF PM_{10} CONCENTRATIONS ABOVE



PSD INCREMENTS DURING WELL CONSTRUCTION

**TABLE 4-4.
ACUTE SHORT-TERM HAZARDOUS AIR POLLUTANTS MODELING RESULTS FOR ALL ALTERNATIVES**

HAP	Modeled 1-Hour Concentration (µg/m^3)	Reference Exposure Levels (µg/m^3)	Percentage of Reference Exposure Level (%)
Benzene	1.37	1,300	0.11
Ethyl Benzene	2.91	350,000	<0.1
Formaldehyde	7.49	55	14
N-Hexane	9.98	390,000	<0.1
Toluene	1.05	37,000	<0.1
Xylene	0.72	22,000	<0.1

Of the HAPs evaluated, only benzene, ethyl benzene, and formaldehyde are identified by the USEPA as being carcinogens. Unit risk factors for this analysis were derived based on assuming a person is exposed to the HAP for a 70-year lifetime. Cancer risk was estimated by calculating the annual model-predicted concentrations by the unit risk factor for each carcinogen. The resulting calculations were then scaled by adjustment factors to represent the most likely exposure and maximally exposed individual risks. The maximally exposed individual adjustment takes into account the lifetime of the project, which was assumed to be 50 years. The most likely exposure adjustment takes into account the average duration that a family remains at a residence as well as the time spent at home versus time spent elsewhere. Table 4-6 presents the results of the carcinogenic HAP modeling for both the most likely exposure and maximally exposed individual exposure assumptions. The maximum cancer risks were associated with drilling operations and were well below an incremental increase in cancer risk of 1 per million.

Far-field Criteria Air Pollutant Concentrations

Far-field photochemical grid modeling would be performed in the future, as explained in the ARMP in the *Air Resources and Climate Appendix*. Photochemical grid modeling would assess ozone and other criteria pollutant concentrations and would be performed when adequate regional oil and gas emission inventories become available. Based on the highest-emitting alternative (Alternative A), a qualitative description of potential air quality impacts is provided below for each criteria air pollutant. Impacts to air pollutant concentrations would be direct impacts with durations similar to the duration of emission-producing activities. The impacts would be reversible because they decline or disappear when emissions cease. For each criteria air pollutant, impacts would be expected to be below the NAAQS and MAAQS based on recent monitoring in oil and gas areas.

**TABLE 4-5.
CHRONIC NON-CARCINOGENIC HAZARDOUS AIR POLLUTANT MODELING RESULTS FOR ALL ALTERNATIVES**

HAP	Modeled Annual Concentration (µg/m^3)	Reference Concentration (µg/m^3)	Percentage of Reference Concentration (%)
Benzene	0.02	3	0.01
Ethyl Benzene	0.06	1,000	0.01
Formaldehyde	0.02	9.80	0.20
N-Hexane	0.36	700	0.05
Toluene	0.03	5,000	0.01
Xylene	0.01	100	0.01

TABLE 4-6.
CARCINOGENIC HAZARDOUS AIR POLLUTANT MODELING RESULTS FOR ALL ALTERNATIVES

HAP	Modeled Annual Concentration ($\mu g/m^3$)	Unit Risk Factor $(\mu g/m^3)^{-1}$	Adjustment Factor	Cancer Risk (Per Million)	Risk Exceeds 1 Per Million?
Most Likely Exposure					
Benzene	0.025	7.80×10^{-6}	0.0949	0.02	No
Ethyl Benzene	0.064	2.50×10^{-6}	0.0949	0.02	No
Formaldehyde	0.018	1.30×10^{-5}	0.0949	0.02	No
Maximally Exposed Individual					
Benzene	0.025	7.80×10^{-6}	0.71	0.14	No
Ethyl Benzene	0.064	2.50×10^{-6}	0.71	0.11	No
Formaldehyde	0.018	1.30×10^{-5}	0.71	0.17	No

The Sidney monitor in Richland County had quality assured data for years 2010 to 2012 for most criteria air pollutants except sulfur dioxide (2011-2012 data only).

- Carbon monoxide: carbon monoxide concentrations are not monitored within the planning area because expected concentrations are low. A 2.7-percent emission increase (based on oil and gas activities under the proposed alternative) in the planning area would cause a negligible increase in carbon monoxide concentrations.
- Nitrogen dioxide: nitrogen dioxide monitors in Birney, Broadus and Sidney measured 3-year average 98th percentile 1-hour nitrogen dioxide concentration from 2010 to 2012 of 8, 16 and 9 percent respectively, of the NAAQS. The proposed alternative would cause a 1.1 percent NO_2 emission increase in the planning area would cause a negligible increase in nitrogen dioxide concentrations in most areas. A larger increase in ambient concentrations may occur in some localized areas in which large engines operate continuously.
- Sulfur dioxide: the sulfur dioxide monitor in Sidney measured a 2010-2013 average 99th percentile 1-hour concentration equivalent to 7 percent of the NAAQS. Because increased sulfur dioxide emissions would be approximately 0.02 percent of planning area emissions and would be dispersed over large areas, these emissions would cause a negligible increase in sulfur dioxide concentrations.
- Particulate matter (PM_{10}): From 2010 to 2012, 24-hour second maximum particulate matter (PM_{10}) concentrations were approximately 13, 21 and 16 percent of the NAAQS at the Birney, Broadus and Sidney monitors, respectively. An emission increase of 0.4 percent in the planning area under the proposed alternative would cause a minor increase in particulate matter (PM_{10}) concentrations. At locations with construction activities, vehicle traffic on unpaved roads, or off-road travel, temporary particulate matter (PM_{10}) concentration increases may be moderate or high during adverse weather conditions.
- Fine particulate matter ($PM_{2.5.}$): The 2010 to 2012 average fine particulate ($PM_{2.5}$) concentrations were approximately 34, 46 and 43 percent of the 24-hour NAAQS at the Birney, Broadus and Sidney monitors, respectively. For the fine particulate matter ($PM_{2.5}$) annual NAAQS, monitored values were 41, 52 and 55 percent of the NAAQS at the Birney, Broadus, and Sidney monitors, respectively. An emission increase of up to 0.7 percent under the proposed alternative could cause a minor increase in fine particulate ($PM_{2.5}$) concentrations. At locations with construction activities, vehicle traffic on unpaved roads, or off-road travel, temporary fine particulate ($PM_{2.5}$) concentration increases may be moderate or high during adverse weather conditions.
- Lead: lead emissions would be negligible.

Compared to the other pollutants described above, current ozone concentrations are closest to the NAAQS. Ozone concentrations are variable and highly dependent on weather conditions. Consequently, compliance with the ozone NAAQS is based on a 3-year average of the fourth-highest daily maximum 8-hour concentration. The Birney, Broadus, and Sidney monitors measured 3-year average fourth-highest daily 8-hour ozone concentrations of 0.055–0.056 ppm, which is equivalent to 73–75 percent of the standard.

NO_x and VOC emissions contribute to ozone formation. Under the proposed alternative, BLM-authorized emission increases would increase by up to 1.1 percent for nitrogen oxides and by 9.4 percent for VOCs. Based on current monitoring data, cumulative emissions would be unlikely to cause or contribute to a violation of the ozone NAAQS.

AQRV Impacts

AQRV impacts include impacts to visibility; sulfur, nitrogen, and acid deposition; and lake acidification. The best modeling method to determine far-field AQRV impacts for large modeling domains is photochemical grid modeling, which can model long-range regional transport of air pollutants that cause atmospheric deposition and visibility impacts. Reliable photochemical grid modeling requires comprehensive regional emission inventories and ambient monitoring data throughout the 48 contiguous United States. As described in the ARMP in the *Air Resources and Climate Appendix*, the BLM is acquiring data needed to perform photochemical grid modeling, which is expected to be completed after this RMP is finalized. Pending completion of photochemical grid modeling, the following qualitative analysis is provided for atmospheric deposition and visibility. A request from the USFWS and the National Park Service (NPS) prompted a limited modeling effort to estimate visibility impacts using the VISCREEN model for near-field impacts and the CALPUFF model for far-field impacts. This modeling was performed after the Draft RMP/EIS was published and assessed near-field visibility impacts at the UL Bend Wilderness and the Medicine Lake Wilderness Class I areas. Far-field impacts were assessed at the two wilderness areas, at Fort Peck Indian Reservation (a tribal Class I area), and at nearby potential sensitive Class II areas. The modeling included estimated emissions from BLM-authorized oil and gas activities using the highest-emitting MCFO and HiLine District alternatives. Quantitative results from the CALPUFF visibility modeling are summarized below and followed by a qualitative assessment of deposition impacts. Additional information on modeling methodologies and detailed results are provided in the *Miles City Field Office Resource Management Plan Air Resource Technical Support Document* (BLM 2014).

VISCREEN modeling assessed plume visibility impacts at Class I areas, based on an assumption that a drill rig could be located approximately 1 kilometer from a Class I area boundary and a human observer could be located approximately 1 km from the drill rig and the Class I area. The model predicts impacts in terms of a color difference index and a contrast index. As shown in Table 4-7, predicted impacts are less than the following USFWS and NPS thresholds used to identify impacts that may potentially pose a visibility concern (FLAG 2010). Modeling was performed for both high visibility (high standard visual range) days and low visibility (low standard visual range) days. Predicted impacts are provided for cases when an emission plume could be viewed with the sky as background and when a plume could be viewed with terrain as the background.

- Color difference index: $\Delta E \geq 2.00$
- Contrast: $|C| \geq 0.05$

TABLE 4-7.
VISCREEN PLUME VISIBILITY MODELING RESULTS FOR ALL ALTERNATIVES

Class I Area/ Background	Low Standard Visual Range		High Standard Visual Range	
	ΔE	**| C |**	**ΔE**	**| C |**
Medicine Lake Wilderness				
Sky	0.043	0.001	0.043	0.001
Terrain	0.850	0.001	0.898	0.001
UL Bend Wilderness				
Sky	0.043	0.001	0.044	0.001
Terrain	0.880	0.001	0.930	0.001

Results from the CALPUFF far-field visibility modeling are shown in Table 4-8. The modeling domain included approximately the northern 40 percent of the MCFO and the eastern and central portions of the HiLine District. Modeled emissions included federal oil and gas emissions from the MCFO and HiLine District based on their highest emission alternatives. While all of the HiLine emissions were included in the domain, only the portion of MCFO emissions likely to be located within the domain, were included. Visibility impacts are predicted to be below the 0.5 deciview change (Δdv) threshold included in FLAG 2010 to identify impacts that may potentially pose a visibility concern.

Wildlife Refuge

Sulfur and nitrogen deposition impacts would likely be minor at Class I and sensitive Class II areas. Increases in nitrogen oxides and sulfur dioxide emissions would be less than 1.3 percent and 0.01 percent, respectively. Potential total nitrogen and sulfur deposition would likely remain below the levels of concern (3.0 kg/ha/yr and 5.0 kg/ha/yr, respectively) (Pardo 2011 and USFS 1989). Precipitation pH would be unlikely to become acidified because of predicted emission increases. The closest federally mandated Class I areas to oil and gas development areas are the Medicine Lake Wilderness in the planning area, the UL Bend Wilderness adjacent to the planning area, and Theodore Roosevelt National Park in North Dakota. Tribal Class I areas include the Northern Cheyenne and Fort Peck Indian Reservations. With regard to potential sensitive Class II areas listed in Table 3-5, some of these areas could experience small increases in deposition. As part of a future photochemical modeling effort, deposition impacts would be assessed as described in the ARMP included in the *Air Resources and Climate Appendix*.

TABLE 4-8.
CALPUFF VISIBILITY MODELING RESULTS FOR ALL ALTERNATIVES

Area Type/ Area Name	Jurisdictional Agency	Deciview Change (98th percentile, Δdv)		
		2006	2007	2008
Mandatory Class I				
Medicine Lake Wilderness	FWS	0.080	0.078	0.072
UL Bend Wilderness	FWS	0.053	0.076	0.085
Non-mandatory (Tribal) Class I				
Fort Peck Indian Reservation	Sioux and Assiniboine Tribes	0.113	0.076	0.104
Sensitive Class II				
Bear Paw Battlefield	NPS	0.069	0.058	0.055
Black Coulee NWR	FWS	0.075	0.055	0.077
Bowdoin NWR	FWS	0.084	0.059	0.106
Charles M. Russell NWR	FWS	0.045	0.051	0.060
Creedman Coulee NWR	FWS	0.107	0.120	0.106
Fort Belknap Indian Reservation	Gros Ventre and Assiniboine Tribes	0.050	0.059	0.054
Hewitt Lake NWR	FWS	0.123	0.092	0.131
Lake Thibadeau NWR	FWS	0.045	0.116	0.119
Medicine Lake NWR	FWS	0.052	0.046	0.044
Rocky Boy Indian Reservation	Chippewa Cree Tribe	0.058	0.052	0.050

NWR = National

Small increases in sulfur and nitrogen deposition would potentially cause minor potential lake acidification impacts at Class I and potential sensitive Class II areas. As part of a future photochemical modeling effort, lake acidification impacts would be assessed as described in the ARMP included in the *Air Resources and Climate Appendix*.

Under the proposed alternative, total emissions of nitrogen oxides and sulfur dioxide from existing and future activities would be approximately 2,512 tons per year, compared to National Emission Inventory emissions of

38,914 tons per year. This represents a regional emission increase of up to 6 percent; however, in localized areas with oil and gas activities, the percentage increase in emissions would be greater. As part of the future photochemical modeling effort mentioned above, visibility impacts at Class I and sensitive Class II areas would be assessed using cumulative emission inventories as described in the *Air Resources and Climate Appendix*.

Air Resource Management Plan and Adaptive Management Strategy for Oil and Gas Resources

The ARMP for oil and gas activities is provided in the *Air Resources and Climate Appendix*. The ARMP describes the air quality adaptive management strategy that would be used to assess future air quality and AQRVs. The goal of the strategy is to maintain the good air quality that the population in the planning area currently enjoys. By assessing monitored and modeled air resource and AQRV impacts, the BLM can identify mitigation measures to address unacceptable impacts that may be associated with future oil and gas development. As described in the ARMP, the BLM would work with the MDEQ and the AQTW to identify successful strategies to address air quality and AQRV concerns.

The adaptive management strategy focuses on oil and gas activity because aggregated emissions from multiple small sources at well sites can potentially cause significant air quality and AQRV impacts under certain circumstances. Many of these emission sources are regulated by the MDEQ, which implements air quality permitting and facility registration programs for oil and gas facilities that have the potential to emit 25 tpy or more of any regulated air pollutant. These programs include emission control requirements, which are summarized in Section 1.5.2 within the Air Resource Management Plan in the *Air Resources and Climate Appendix*. Some types of temporary sources (such as drill rig engines) and oil and gas facilities with potential emissions less than 25 tpy may not be subject to regulatory controls imposed by the MDEQ. The adaptive management strategy provides the BLM with a means to address air quality or AQRV concerns that could occur due to emissions from unregulated sources or aggregated emissions from many closely-spaced sources.

The oil and gas adaptive management strategy was prepared in collaboration with the USEPA and three federal land management agencies under the *Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act {NEPA} Process* (USDA, USDI and USEPA 2011). This Memorandum of Understanding (MOU) is summarized in the ARMP The ARMP includes both near-term actions and long-term actions. In the near-term, the ARMP sets forth initial mitigation measures to maintain good air quality until regional photochemical grid modeling can be performed to further assess potential impacts to air quality (including ozone) and AQRVs. Additional monitoring data and regional emission inventory data are being acquired to support photochemical grid modeling, which is expected to be completed in 2015. In the longer term, the ARMP provides ongoing management strategies to assess and adapt to new air quality and AQRV ambient monitoring and modeling data during the life of this RMP.

The ARMP includes a multifaceted approach involving the following activities:

- oil and gas activity assessment,
- ambient air quality monitoring support,
- air quality and AQRV assessment,
- future air quality and AQRV modeling, and
- mitigation.

Pollutants addressed by the ARMP include carbon monoxide, nitrogen dioxide, O_3, particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and sulfur dioxide (SO_2). The ARMP also addresses modeling and mitigation for the following AQRVs:

- deposition of sulfur and nitrogen,
- lake acid neutralizing capacity, and
- visibility.

The adaptive management strategy for oil and gas resources provides the flexibility to respond to changing conditions that could not have been predicted during RMP development. The strategy also allows for the use of new technology and methods that may minimize or reduce impacts.

Air Quality Impacts from Climate Change

Air quality impacts from climate change may include increases in ambient ozone concentrations and increases or decreases in particulate matter concentrations (USEPA 2009d). Increased temperatures associated with climate change have the potential to increase ground-level ozone formation, although this effect would be more pronounced in regions with relatively high ozone concentrations rather than in regions with relatively low ozone concentrations. Climate change also has the potential to increase emissions of ozone precursors, such as increased biogenic and fugitive source VOC emissions although there is much uncertainty in this regard. The potential cumulative impact of climate change on particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) is less well understood. A range of increases and decreases in particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) concentrations may occur in different regions, and for different component chemical species in the same region. For example, climate changes that involve increased precipitation would decrease fugitive dust emissions while drier soils (particularly during the summer and fall) would increase fugitive dust emissions.

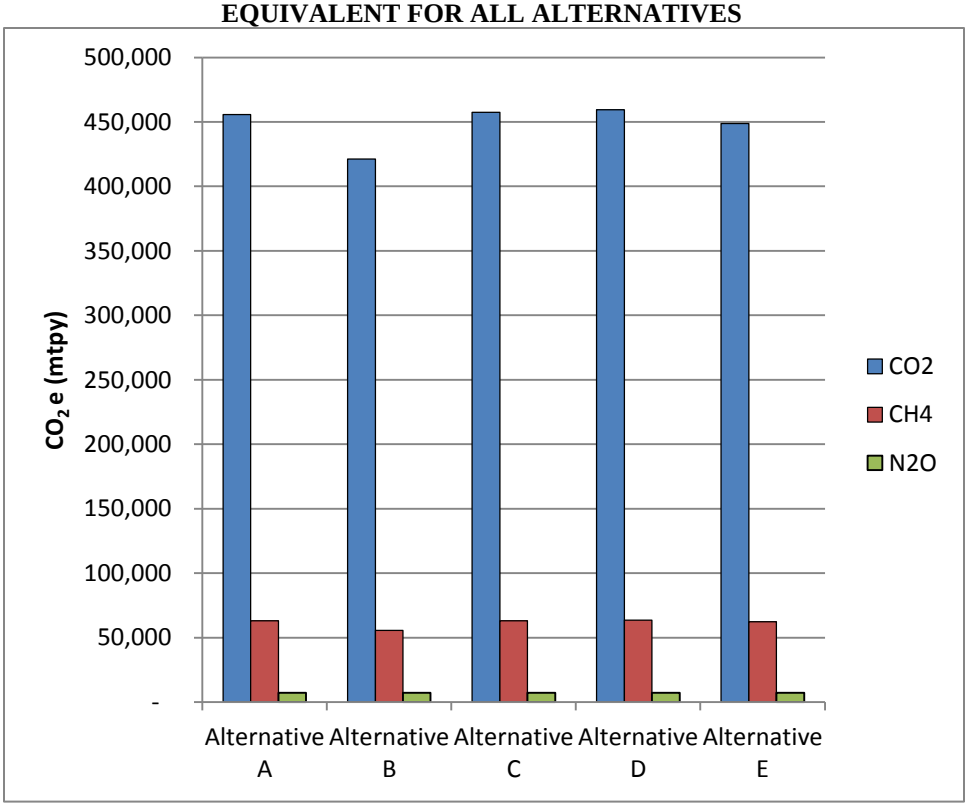
Because of the inability to accurately model the effects of local GHG emissions on climate change, this analysis provides a summary of GHG emissions associated with the alternatives and a comparison of these emissions to other GHG inventories. GHG emissions were estimated using methodologies similar to those used for criteria air pollutants and included GHG emission that would be directly emitted from sources related to fluid mineral development, coal mining, fuels management, resource road maintenance, BLM travel, forest and woodland treatments, vegetation treatments, and livestock grazing. The emission estimates reflect GHG emissions from BLM-authorized activities occurring within the planning area. GHG emissions from activities outside the planning area were not included because insufficient data exist to accurately quantify these emissions. For example, combustion emissions associated with oil and natural gas produced within the planning area and combusted outside the planning area were not included in the inventory. GHG emissions from wildfires were not included in the emission inventories because these emissions would be beyond the BLM's control and occur every year (although wildfire intensity and magnitude can vary greatly from year to year). GHG emissions from prescribed fire and fire prevention activities were included in the inventory since these activities result from BLM-authorized activities. GHG emission inventories are included in the *Air Resources and Climate Appendix*.

GHG emission sinks caused by sequestration and changes in land use were not estimated because insufficient data and methodologies exist for estimating carbon uptake in vegetation and soils. BLM activities that improved forest and vegetation health would tend to increase carbon dioxide uptake from the atmosphere and reduce atmospheric concentrations. Increased carbon sequestration on land administered by the BLM would offset GHG emission increases from other BLM sources.

GHG emission inventories developed as part of this analysis are expressed in short tons per year because emission factors used to calculate emissions were available in units of pounds and short tons. However, state, national, and global emission inventories are typically provided in terms of metric tons per year (mtpy). Consequently, GHG emissions provided in this section are also given in terms of mtpy in order to compare alternative emissions with other GHG inventories. Figure 4-3 illustrates carbon dioxide, methane, and nitrous oxide emissions for each alternative.

Differences in cumulative GHG emission impacts among the alternatives would be negligible when considered on state, national, or global scales. GHG emissions under the highest-emitting alternative would be a small percentage of Montana, United States, and global emissions. Alternative D carbon dioxide equivalent (CO_2e) emissions would be approximately 1.0 percent of Montana emissions, 0.01 percent of United States emissions, and 0.002 percent of global GHG emissions.

**FIGURE 4-3.
GREENHOUSE GAS EMISSIONS IN TERMS OF CARBON DIOXIDE EQUIVALENT FOR ALL ALTERNATIVES**



GHG emissions from multiple activities would likely decrease in future years as a result of future federal regulation of GHGs. The USEPA's August 16, 2012 New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants rule is expected to decrease national CH_4 emissions from affected oil and gas systems by approximately 26 percent (USEPA 2012). A previous light-duty vehicle regulation imposed carbon dioxide emission standards for new vehicles. As new vehicles replace existing vehicles, carbon dioxide emissions will decline on a per-mile basis. The USEPA is collecting GHG emission data and is considering additional future regulation.

Several federal initiatives have been launched to improve the ability to understand, predict, and adapt to the challenges of climate change. The Secretary of the Interior signed Secretarial Order 3289 on February 22, 2010, establishing a Department-wide, science-based approach to increase understanding of climate change and to coordinate an effective response to impacts on managed resources. The order reiterated the importance of analyzing potential climate change impacts when undertaking long-range planning issues, and also established several initiatives including the development of eight Regional Climate Science Centers. Regional Climate Science Centers would provide scientific information and tools that land and resource managers can apply to monitor and adapt to climate changes at regional and local scales (Secretarial Order 3289, February 22, 2010). The North Central Climate Science Center, which will include the planning area, was established in 2011. Given the broad spatial influence of climate change that requires response at the landscape-level, the USDI also established Landscape Conservation Cooperatives, which are management-science partnerships that help to inform management actions addressing climate change across landscapes. These cooperatives are formed and directed by land, water, wildlife, and cultural resource managers and interested public and private organizations, to increase the scope of climate change response beyond federal lands.

In addition to efforts being undertaken to better respond and adapt to climate change, other federal initiatives are being implemented to mitigate climate change. The Carbon Storage Project was implemented to develop carbon sequestration methodologies for geological (i.e., underground) and biological (e.g., forests and

rangelands) carbon storage. The project is a collaboration of federal agency and external stakeholders to enhance carbon storage in geologic formations and in plants and soils in an environmentally responsible manner. The Carbon Footprint Project is a project to develop a unified GHG emission reduction program for the USDI, including setting a baseline and reduction goal for the Department's GHG emissions and energy use. More information about the USDI's efforts to respond to climate change is available at http://www.doi.gov/whatwedo/climate/cop15/index.cfm.

In addition to emissions of GHGs regulated by the USEPA under climate change regulations, emissions of diesel combustion particulate and other black carbon emissions from forest fires contribute to climate change by reducing the reflectivity of the earth's surface. This effect is greatest when black carbon is deposited on snow because the darker surface absorbs more sunlight, melts the snow more quickly, and heats the earth's surface. Current and future air quality regulations will reduce emissions of carbon dioxide, methane, and nitrous oxide from many types of sources including oil and gas equipment and operations, vehicles, and many types of engines.

Soil management occurs as an integral part of many activities, including oil and gas development, road maintenance, mining, fire management, forestry and woodland management, livestock grazing, and vegetation management. Consequently, emissions related to soil management are included in emission inventories for these specific types of activities.

Management of soil resources throughout the planning area would require submission of an approved reclamation plan before beginning surface-disturbing activities. These plans would reflect the complexity, environmental concerns, and reclamation potential of the site. Reclamation would reduce fugitive dust emissions by re-vegetating areas after project completion. Additionally, although projects to promote soil stabilization, including emergency stabilization and rehabilitation following wildfire, would have a beneficial long-term impact to air quality by reducing susceptibility to wind erosion, they could create short-term increases in fugitive dust and exhaust emissions during and immediately following project implementation.

Soil management occurs as an integral part of many activities, including oil and gas development, road maintenance, mining, fire management, forestry and woodland products, livestock grazing, and vegetation management. GHGs, primarily carbon dioxide, are stored in soil and in plant mass (foliage and roots). Activities that disturb soil and remove vegetation can release soil carbon dioxide into the atmosphere and reduce future carbon dioxide sequestration in plant matter. However, once site reclamation occurs and new vegetation is planted, carbon dioxide uptake into plant matter increases. GHG emission inventories for surface-disturbing activities include GHG emissions released by equipment and vehicles but do not include estimates of GHG emissions from soil or plant matter. Methods for accurately estimating soil and plant matter GHG releases to the atmosphere and uptake from the atmosphere are not available.

Vegetation treatments improve overall land health using manual, mechanical, chemical, and biological treatment techniques. Emissions associated with vegetation management activities were calculated based on the amount of surface disturbance and primarily reflect fugitive dust and equipment exhaust emissions. Emissions from chemical substances (such as herbicides) were not estimated. Vegetation management projects would have a long-term beneficial air quality impact by reducing susceptibility to wind erosion. However, short-term increases in fugitive dust and equipment exhaust emissions would occur during and immediately following vegetation management activities.

Vegetation treatments improve overall land health and may increase long-term soil and vegetative uptake of carbon dioxide from the atmosphere. However, short-term increases in carbon dioxide and nitrous oxide emissions from equipment exhaust would occur during vegetation management activities. Short-term decreases in carbon dioxide uptake may also occur if vegetation is removed during treatment activities.

Management activities to protect wildlife and special status species would typically reduce air quality impacts or relocate them to other areas. Habitat protection activities that limit vehicle and human access, surface-disturbing activities, and noise would reduce engine exhaust and fugitive dust emissions in locations subject to these limitations. In some cases, emission-producing activities would be relocated to other areas and total emissions would not change. In other cases, these activities might not occur or might occur on state or private

land. Emission calculations generally do not account for habitat protection management actions because insufficient data are available to determine the likelihood of emission source relocation to other areas.

Management activities to protect wildlife and special status species would typically decrease GHG emissions or relocate them to other areas. Habitat protection activities that limit surface-disturbing activities and vehicle and human access would reduce engine exhaust emissions in locations subject to these limitations. In some cases, GHG-producing activities would be relocated to other areas and total GHG emissions would not change. In other cases, these activities might not occur. GHG emission calculations generally do not account for habitat protection management actions because insufficient data are available to determine the likelihood of emission source relocation to other areas.

Fire management and ecology activities include preventive activities such as forest thinning and prescribed fires, as well as fighting wildfires. Smoke contains all criteria air pollutants (carbon monoxide, nitrogen oxides, VOC, sulfur dioxide, particulate matter [PM_{10}], and fine particulate matter [$PM_{2.5}$]), many HAPs, and large quantities of GHGs, primarily carbon dioxide. Prescribed burns are begun only when atmospheric conditions provide safe fire control conditions and when ambient concentrations of fire-related pollutants would be acceptable. The size of the prescribed fire, and the current and expected weather conditions, including the predicted wind speed and direction, would be reviewed prior to burning to assure good smoke dispersal. Prescribed burns would be completed in a manner that is consistent with procedures established by the Montana/Idaho Airshed Group under the authority of the Montana Open Burning Regulations (Administrative Rules of Montana [ARM] Title 17, Section 8, Sub-chapter 6). Wildfire smoke quantities and pollutant concentrations would vary with the amount and type of fuel burned and atmospheric conditions. Wildfires would cause short-term emissions from smoke and the use of heavy equipment during fire suppression activities. Long-term wildfire impacts include increased fugitive dust emissions from lack of vegetation. In addition, intense wildfires would alter soil chemistry and reduce natural vegetative growth. Fire mitigation activities following wildfires would cause increased equipment exhaust and fugitive dust emissions.
During large wildfires, fine particulate matter ($PM_{2.5}$) could spread over many miles and affect areas outside the planning area, including Class I areas and sensitive Class II areas. In addition to increased concentrations of particulate, carbon monoxide, VOCs, and HAPs, large wildfires adversely affect visibility. Individual wildfire impacts can last from a few days to several weeks, while impacts from multiple fires within the region can occur throughout the fire season.

Fire management and ecology activities include preventive activities such as forest thinning and prescribed burning, as well as fighting wildfires. Smoke from prescribed burning and wildfires contain large quantities of carbon dioxide. In addition to emissions from smoke, vehicle and equipment exhaust emissions contribute small amounts of carbon dioxide and nitrous oxide to the atmosphere.

Short-term fugitive dust emissions would occur primarily while woodland treatments are in progress. Emissions of carbon monoxide, nitrogen oxides, particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), sulfur dioxide, VOCs, and HAPs would be released from vehicles and equipment used during these activities. Over the long-term, re-vegetation and land reclamation would reduce fugitive dust.

Short-term vehicle exhaust emissions would occur while woodland treatments are in progress. Carbon dioxide emissions would increase if woodland slash was burned.

Livestock grazing has the potential to affect air quality through land disturbance from grazing animals, land disturbance for range improvements, wind erosion, and vehicle usage to access and transport livestock.

Rangeland health standards would be used to determine if soil and site stability was achieved. Adjustments to the grazing authorization would be made as needed to ensure that fugitive dust emissions were not excessive. Livestock grazing releases large quantities of methane, which is approximately 21 times more potent than carbon dioxide in terms of global warming potential (according to USEPA regulations). Methane has a short atmospheric lifetime of 12 years.

Coal mining is the largest solid mineral mining activity within the planning area and it would be expected to continue at rates similar to those experienced in the past. This activity would contribute to the generation of

fugitive dust (PM_{10} and $PM_{2.5}$) at surface facilities from material handling, wind erosion from material stockpiles, and vehicle traffic. Additional pollutants would include carbon monoxide, nitrogen oxides, sulfur dioxide, VOCs, and HAPs from engine exhaust.

Coal mining would also contribute to the generation of GHG emissions associated with exhaust from vehicles and equipment. Fugitive coal dust also contributes to climate change if it is deposited on snow or other highly reflective surfaces.

Fluid mineral development and production activities in the planning area would increase criteria air pollutant and HAP emissions through engine exhaust, fugitive organic emissions, and fugitive dust.

Oil and gas development and production activities in the planning area would increase GHG emissions, particularly emissions of carbon dioxide and methane.

Relatively few developed recreation sites are located within the planning area. Limited hunting, dispersed limited camping, hiking, and off-road travel occur within the area. Recreational uses may cause minor localized emission increases through vehicle exhaust and small areas of surface disturbance. Because of the relatively small quantity of air pollutants associated with recreational activities, emissions from recreational activities were not included in the emission inventory.

GHG emissions from recreational activities are caused primarily by vehicle emissions of carbon dioxide and nitrous oxide.

Air quality and AQRV impacts from vehicle travel, including road maintenance and OHV use, would result from fugitive dust and exhaust emissions attributable to vehicle travel, including road maintenance and OHV use. Travel-related impacts depend on the route or trail surface material and condition, type of vehicle, size of vehicle, and vehicle speed. Although the alternatives differ in terms of the number of routes that would remain open, open with restrictions, or closed, emissions would depend largely on total vehicle miles traveled. Because the public may shift use to other roads in the same area or move to a different area, emissions may remain consistent for the planning area regardless of road closure and restrictions.

Fugitive dust from wind erosion would decrease in areas in which road closures allowed native plants to recolonize previously disturbed areas. Limiting authorized travel to administrative use would reduce traffic and emissions on these routes.

Construction or maintenance of higher standard unpaved routes has the potential to allow greater travel speeds and increased fugitive dust. Unimproved and unmaintained routes generally reduce speeds and fugitive dust. Emissions from trails and travel management are largely represented in the alternative emission inventories in the following categories: BLM travel, BLM road maintenance, and resource-specific management activities, such as fire management and vegetation management.

Vehicle travel, road maintenance activities, and OHV use would cause exhaust emissions of carbon dioxide and nitrous oxide.

Air quality and AQRV impacts from land use authorizations are expected to be minor. New road rights of way (ROWs) cause short-term (construction) and long-term (use) impacts and emissions depend on the type of road surface, length and width of the road, and the number of vehicles and speed at which they travel. Utility ROWs generally have smaller long-term air quality impacts than road ROWs because vegetation is restored and only a small number of vehicles would travel through the ROW for maintenance purposes.

Emissions from ROW authorizations were not calculated because land disturbances are expected to be small. Emissions for surface-disturbing activities associated with roads for oil and gas activities are included in the oil and gas emission calculations. New ROWs would cause short-term (construction) and long-term (vehicle use) increases in GHG emissions. GHG emissions from ROW authorizations were not calculated because land disturbances are expected to be small. However, GHG emissions for surface-disturbing activities associated with roads for oil and gas activities are included in the oil and gas emission calculations.

ALTERNATIVE A (No Action)

Impacts in specific areas of the planning area would depend on the location of fluid mineral and other emission-producing activities. Fluid mineral development and production activities in the planning area would increase criteria air pollutant, HAP, and GHG emissions through engine exhaust, fugitive organic emissions, and fugitive dust. Other activity levels are similar to those experienced in prior years. Resource-specific emissions are provided in Tables 4-9 and 4-10.

TABLE 4-9.
BLM SOURCE GREENHOUSE GAS EMISSIONS UNDER ALTERNATIVE A

Resource or Resource Use	Emission (Tons per Year)				CO_2e (mtpy)
	CO_2	CH_4	N_2O	CO_2e	
Oil and Gas Development and Production					
Oil	66,500	324	1	73,487	66,685
Natural Gas	20,841	92	0	22,724	20,715
Coal bed Natural Gas	19,211	112	0	21,573	19,576
Coal Mining	104,684	1	1	105,021	95,257
Vegetation Management	34	0	0	35	32
Fire Management [1]	289,046	121	24	298,944	271,151
Forestry and Woodland Products	178	0	0	179	163
Livestock Grazing	1,382	2,666	0	57,377	52,043
Recreation – Trails and Travel Management	78	0	0	83	76
General Purpose BLM Fleet Travel	285	0	0	297	269
Road Maintenance	147	0	0	147	134
BLM Emission Total[2]	**502,386**	**3,316**	**26**	**579,868**	**526,100**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

TABLE 4-10.
BLM SOURCE CRITERIA POLLUTANT EMISSIONS UNDER ALTERNATIVE A

Resource or Resource Use	Emissions (Tons per Year)						
	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAP
Oil and Gas Dev & Prod							
Oil	539	244	0	54	16	443	37
Natural Gas	209	86	0	14	5	59	6
Coal Bed Natural Gas	236	119	0	25	8	82	16
Coal Mining	2,140	1,821	180	4,491	449	145	15
Vegetation Management	11	0	0	11	1	3	0
Fire Management [1]	1,742	58	14	211	151	97	10
Forestry and Woodland Products	1	1	0	4	0	0	0
Livestock Grazing	11	9	0	137	14	4	0
Recreation – Trails and Travel Management	27	0	0	293	30	27	3
General Purpose BLM Fleet Travel	4	2	0	75	8	2	0
Road Maintenance	0	1	0	1	0	0	0
BLM Emission Total	**4,921**	**2,343**	**195**	**5,315**	**683**	**863**	**86**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

ALTERNATIVE B

Alternative B would have small to substantial emission decreases compared to Alternative A. Alternative B emission changes vary from -0.1 percent to -24.1 percent depending on the pollutant. Impacts in specific areas of the planning area would depend on the location of fluid mineral and other emission-producing activities.

Resource-specific emissions are provided in Tables 4-11 and 4-12.

TABLE 4-11.
BLM SOURCE CRITERIA POLLUTANT EMISSIONS UNDER ALTERNATIVE B

Resource or Resource Use	Emissions (Tons per Year)						
	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAP
Oil and Gas Dev & Prod							
Oil	344	156	0	35	10	283	24
Natural Gas	134	55	0	9	3	38	4
Coal bed Natural Gas	159	81	0	17	5	55	11
Coal Mining	2,140	1,821	180	4,491	449	145	15
Vegetation Management	11	0	0	11	1	3	0
Fire Management [1]	1,742	58	14	211	151	97	10
Forestry and Woodland Products	0	0	0	1	0	0	0
Livestock Grazing	11	9	0	137	14	4	0
Recreation – Trails and Travel Management	27	0	0	293	30	27	3
General Purpose BLM Fleet Travel	4	2	0	74	7	2	0
Road Maintenance	1	1	0	1	0	0	0
BLM Emission Total	**4,573**	**2,183**	**195**	**5,278**	**672**	**655**	**66**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

TABLE 4-12.
BLM SOURCE GREENHOUSE GAS EMISSIONS UNDER ALTERNATIVE B

Resource or Resource Use	Emissions (Tons per Year)				CO_2e (mtpy)
	CO_2	CH_4	N_2O	CO_2e	
Oil and Gas Dev & Prod					
Oil	42,358	206	0	46,815	42,482
Natural Gas	13,320	59	0	14,523	13,239
Coal bed Natural Gas	12,986	75	0	14,582	13,232
Coal Mining	104,684	1	1	105,021	95,257
Vegetation Management	34	0	0	35	32
Fire Management [1]	289,046	121	24	298,944	271,151
Forestry and Woodland Products	9	0	0	9	8
Livestock Grazing	1,382	2,458	0	53,010	48,082
Recreation – Trails and Travel Management	78	0	0	83	76
General Purpose BLM Fleet Travel	282	0	0	293	266
Road Maintenance	154	0	0	154	140
BLM Emission Total[2]	**464,331**	**2,921**	**25**	**533,470**	**483,964**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

ALTERNATIVE C

Alternative C would potentially result in emissions up to 1.5 percent greater than Alternative A emissions. Impacts in specific areas of the planning area would depend on the location of fluid mineral and other emission-producing activities.

Resource-specific emissions are provided in Tables 4-13 and 4-14.

TABLE 4-13.
BLM SOURCE CRITERIA POLLUTANT EMISSIONS UNDER ALTERNATIVE C

Resource or Resource Use	Emissions (Tons per Year)						
	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAP
Oil and Gas Dev & Prod							
Oil	549	249	0	55	16	453	38
Natural Gas	214	89	0	14	5	60	6
Coal bed Natural Gas	238	120	0	26	8	82	16
Coal Mining	2,140	1,821	180	4,491	449	145	15
Vegetation Management	11	0	0	11	1	3	0
Fire Management [1]	1,742	58	14	211	151	97	10
Forestry and Woodland Products	2	2	0	6	1	0	0
Livestock Grazing	11	9	0	137	14	4	0
Recreation – Trails and Travel Management	27	0	0	293	30	27	3
General Purpose BLM Fleet Travel	5	2	0	71	7	2	0
Road Maintenance	1	1	0	2	0	0	0
BLM Emission Total	**4,939**	**2,352**	**195**	**5,316**	**683**	**875**	**88**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

TABLE 4-14.
BLM SOURCE GREENHOUSE GAS EMISSIONS UNDER ALTERNATIVE C

Resource or Resource Use	Emissions (Tons per Year)				CO_2e (mtpy)
	CO_2	CH_4	N_2O	CO_2e	
Oil and Gas Dev & Prod					
Oil	67,595	330	1	74,730	67,813
Natural Gas	21,230	95	0	23,160	21,113
Coal bed Natural Gas	19,418	109	0	21,728	19,717
Coal Mining	104,684	1	1	105,021	95,257
Vegetation Management	34	0	0	35	32
Fire Management [1]	289,046	121	24	298,944	271,151
Forestry and Woodland Products	314	0	0	316	287
Livestock Grazing	1,382	2,659	0	57,243	51,921
Recreation – Trails and Travel Management	78	0	0	83	76
General Purpose BLM Fleet Travel	300	0	0	312	283
Road Maintenance	161	0	0	161	146
BLM Emission Total	**504,242**	**3,316**	**26**	**581,735**	**527,796**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

ALTERNATIVE D

Alternative D emissions would be up to 2.5 percent greater than Alternative A emissions. Impacts in specific areas of the planning area would depend on the location of fluid mineral and other emission-producing activities.

Resource-specific emissions are provided in Tables 4-15 and 4-16.

TABLE 4-15.
BLM SOURCE CRITERIA POLLUTANT EMISSIONS UNDER ALTERNATIVE D

Resource or Resource Use	Emissions (Tons per Year)						
	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAP
Oil and Gas Dev & Prod							
Oil	559	253	0	56	16	460	38
Natural Gas	217	89	0	14	5	61	6
Coal bed Natural Gas	243	123	0	26	8	84	16
Coal Mining	2,140	1,821	180	4,491	449	145	15
Vegetation Management	11	0	0	11	1	3	0
Fire Management [1]	1,742	58	14	211	151	97	10
Forestry and Woodland Products	3	4	0	11	1	0	0
Livestock Grazing	11	9	0	137	14	4	0
Recreation – Trails and Travel Management	27	0	0	293	30	27	3
General Purpose BLM Fleet Travel	5	2	0	73	7	2	0
Road Maintenance	1	1	0	2	0	0	0
BLM Emission Total	**4,957**	**2,361**	**195**	**5,323**	**684**	**884**	**89**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

TABLE 4-16.
BLM SOURCE GREENHOUSE GAS EMISSIONS UNDER ALTERNATIVE D

Resource or Resource Use	Emissions (Tons per Year)				CO_2e (mtpy)
	CO_2	CH_4	N_2O	CO_2e	
Oil and Gas Dev & Prod					
Oil	68,914	336	1	76,160	69,111
Natural Gas	21,586	96	0	23,534	21,453
Coal bed Natural Gas	19,756	115	0	22,185	20,131
Coal Mining	104,684	1	1	105,021	95,257
Vegetation Management	34	0	0	35	32
Fire Management [1]	289,046	121	24	298,944	271,151
Forestry and Woodland Products	524	0	0	527	478
Livestock Grazing	1,382	2,663	0	57,320	51,991
Recreation – Trails and Travel Management	78	0	0	83	76
General Purpose BLM Fleet Travel	304	0	0	316	287
Road Maintenance	161	0	0	161	146
BLM Emission Total[2]	**506,468**	**3,331**	**26**	**584,286**	**530,112**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

ALTERNATIVE E (Proposed)

Alternative E emissions would be less than Alternative A emissions, with changes of -0.3 percent to -5.2 percent depending on the pollutant. Impacts in specific areas of the planning area would depend on the location of fluid mineral and other emission-producing activities. Alternative E would have moderate emissions compared to the other alternatives.

Resource-specific emissions are provided in Tables 4-17 and 4-18.

TABLE 4-17.
BLM SOURCE CRITERIA POLLUTANT EMISSIONS UNDER ALTERNATIVE E

Resource or Resource Use	Emissions (Tons per Year)						
	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAP
Oil and Gas Dev & Prod							
Oil	492	223	3	49	14	405	34
Natural Gas	192	79	0	12	4	54	5
Coal bed Natural Gas	230	116	0	25	8	80	15
Coal Mining	2,140	1,821	180	4,491	449	145	15
Vegetation Management	11	0	0	11	1	3	0
Fire Management [1]	1,742	58	14	211	151	97	10
Forestry and Woodland Products	3	4	0	11	1	0	0
Livestock Grazing	11	9	0	137	14	4	0
Recreation – Trails and Travel Management	27	0	0	293	30	27	3
General Purpose BLM Fleet Travel	5	2	0	73	7	2	0
Road Maintenance	0	1	0	1	0	0	0
BLM Emission Total	**4,853**	**2,314**	**198**	**5,313**	**681**	**818**	**82**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

TABLE 4-18.
BLM SOURCE GREENHOUSE GAS EMISSIONS UNDER ALTERNATIVE E

Resource or Resource Use	Emissions (Tons per Year)				CO_2e (mtpy)
	CO_2	CH_4	N_2O	CO_2e	
Oil and Gas Dev & Prod					
Oil	60,573	296	1	66,959	60,761
Natural Gas	19,118	85	0	20,844	19,000
Coal bed Natural Gas	18,726	109	0	21,028	19,082
Coal Mining	104,684	1	1	105,021	95,257
Vegetation Management	34	0	0	35	32
Fire Management [1]	289,046	121	24	298,944	271,151
Forestry and Woodland Products	524	0	0	527	478
Livestock Grazing	1,382	2,656	0	57,173	51,857
Recreation – Trails and Travel Management	78	0	0	83	76
General Purpose BLM Fleet Travel	304	0	0	316	287
Road Maintenance	147	0	0	147	134
BLM Emission Total	**494,616**	**3,267**	**26**	**571,077**	**518,115**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires. Estimates of wildfire emissions are included in the *Air Resource Technical Support Document* (BLM 2014).
[2]Emission total may not reflect sum of resource-specific emissions due to rounding.

CUMULATIVE

Alternative A (No Action)

Most criteria air pollutant and HAP emissions from BLM sources would be less than non-BLM emissions in the planning area. Increases in coal mining on federal solid mineral estate instead of nonfederal solid mineral estate would likely cause greater BLM particulate emissions than non-BLM particulate emissions. Figure 4-4 shows criteria pollutant and HAP emissions from BLM and from non-BLM sources. Cumulative impacts from BLM sources; projected future non-BLM oil, gas, and coal mining sources; and existing sources would not be expected to exceed the NAAQS or MAAQS for any pollutant. As described in the ARMP in the *Air Resources and Climate Appendix*, ambient concentrations would be monitored to assess impacts. Furthermore, pollutant concentration impacts as well as deposition and visibility impacts would be predicted using future photochemical grid modeling.

Alternative B

Figure 4-5 shows criteria pollutant and HAP emissions from BLM and from non-BLM sources. Cumulative impacts from projected future BLM and non-BLM sources would not be expected to exceed the NAAQS or MAAQS. As described in the ARMP in the *Air Resources and Climate Appendix*, pollutant concentrations would be monitored to assess impacts. Furthermore, pollutant concentration impacts as well as deposition and visibility impacts would be predicted using future photochemical grid modeling.

Alternative C

Figure 4-6 shows criteria pollutant and HAP emissions from BLM and non-BLM sources. Alternative C cumulative pollutant concentrations are expected to be less than the NAAQS and MAAQS. As described in the ARMP in the *Air Resources and Climate Appendix*, pollutant concentrations would be monitored to assess impacts. Furthermore, pollutant concentration impacts as well as deposition and visibility impacts would be predicted using future photochemical grid modeling.

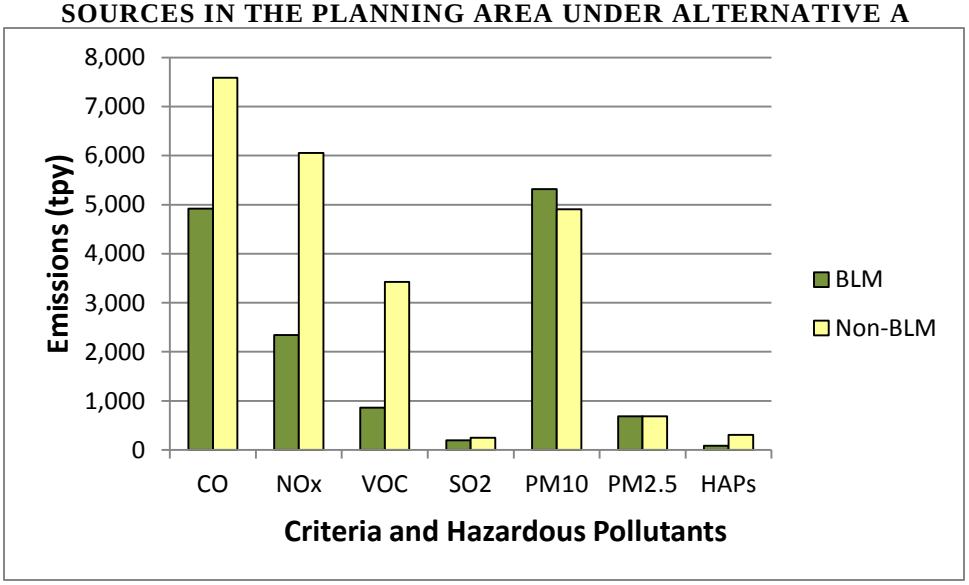
Alternative D

Figure 4-7 shows criteria pollutant and HAP emissions from BLM and from non-BLM sources. Cumulative pollutant concentrations would be expected to be less than the NAAQS and MAAQS. As described in the ARMP in the *Air Resources and Climate Appendix*, pollutant concentrations would be monitored to assess impacts. Furthermore, pollutant concentration impacts as well as deposition and visibility impacts would be predicted using future photochemical grid modeling.

Alternative E (Proposed)

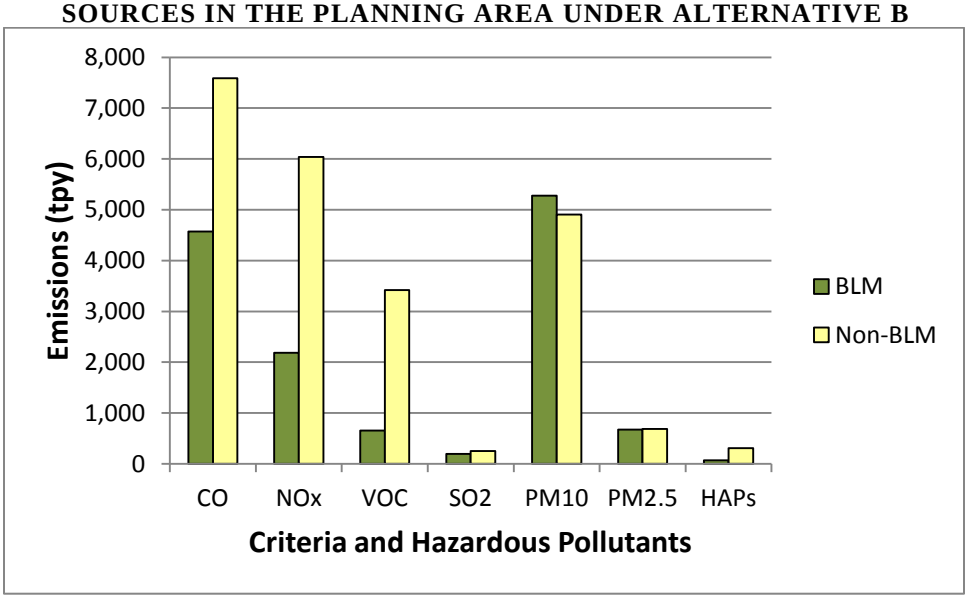
Figure 4-8 shows criteria pollutant and hap emissions from BLM and from non-BLM sources. Cumulative pollutant concentrations are expected to be less than the NAAQS and MAAQS. As described in the ARMP in the *Air Resources and Climate Appendix*, pollutant concentrations would be monitored to assess impacts. Furthermore, pollutant concentration impacts as well as deposition and visibility impacts would be predicted using future photochemical grid modeling.

FIGURE 4-4.
LONG-TERM EMISSIONS FROM BLM AND NON-BLM SOURCES IN THE PLANNING AREA UNDER ALTERNATIVE A



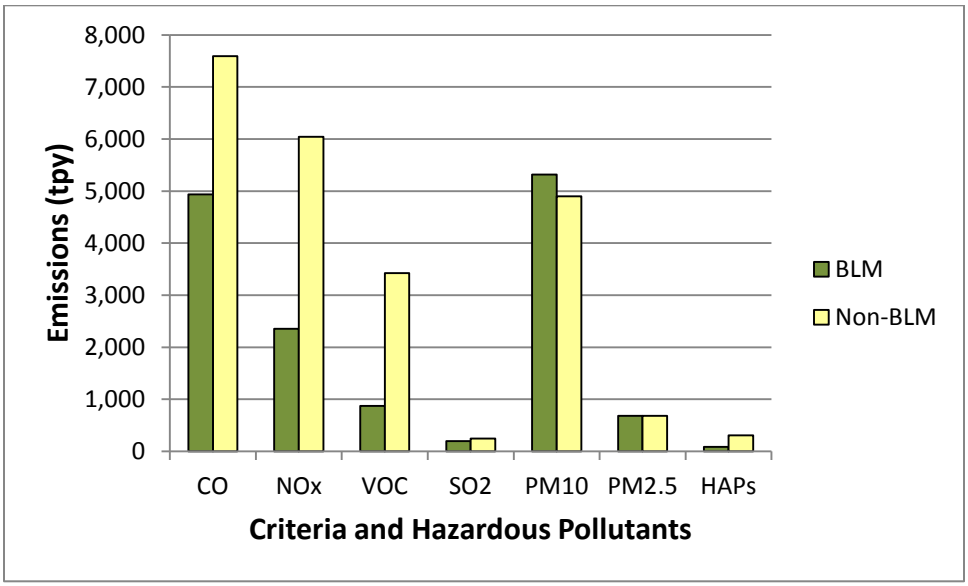
BLM emissions include emissions from multiple resources, including BLM-authorized oil and gas emissions. Non-BLM emissions include emissions from oil and gas activities on state and private mineral estate.

FIGURE 4-5.
LONG-TERM EMISSIONS FROM BLM AND NON-BLM SOURCES IN THE PLANNING AREA UNDER ALTERNATIVE B



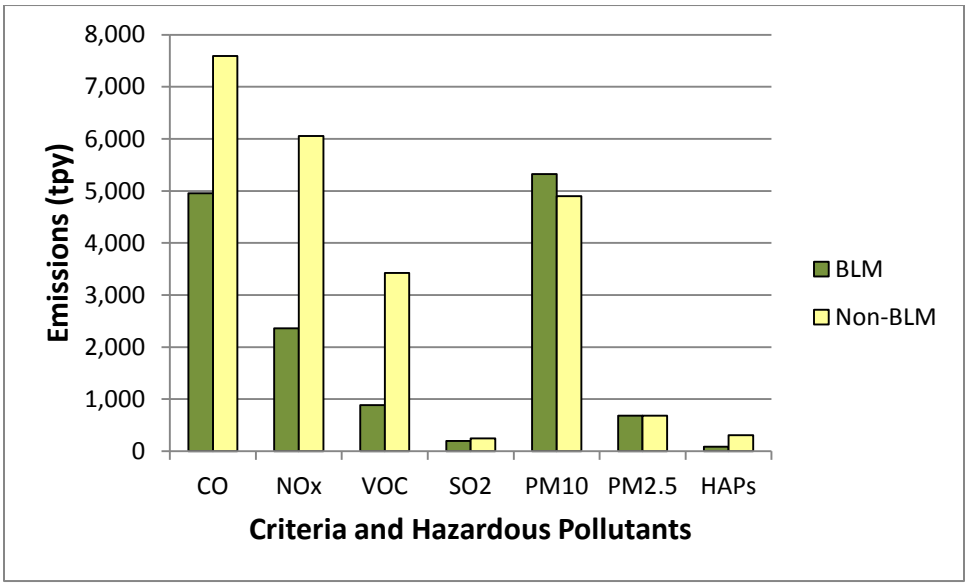
BLM emissions include emissions from multiple resources, including BLM-authorized oil and gas emissions. Non-BLM emissions include emissions from oil and gas activities on state and private mineral estate.

FIGURE 4-6.
LONG-TERM EMISSIONS FROM BLM AND NON-BLM SOURCES IN THE PLANNING AREA UNDER ALTERNATIVE C



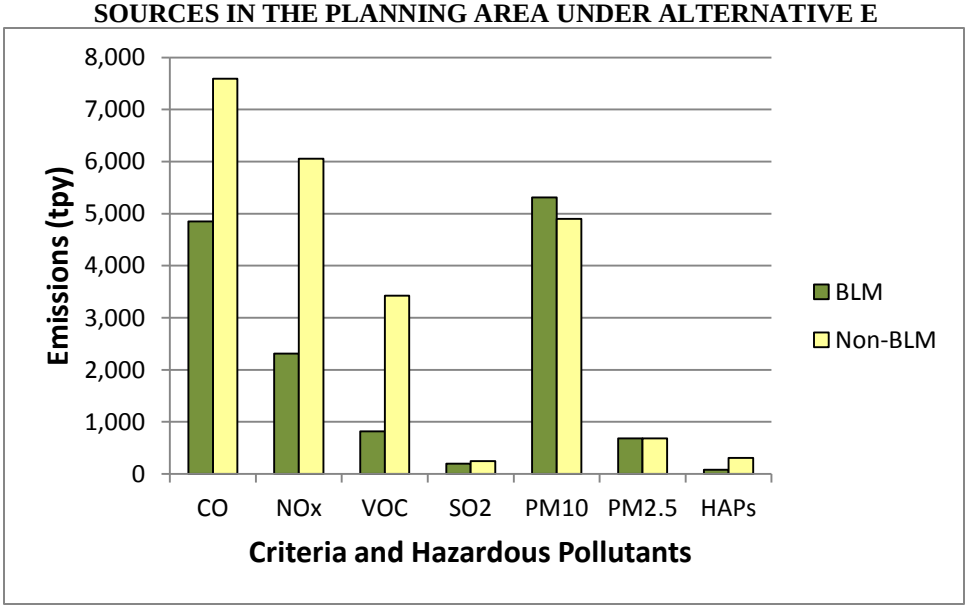
BLM emissions include emissions from multiple resources, including BLM-authorized oil and gas emissions. Non-BLM emissions include emissions from oil and gas activities on state and private mineral estate

FIGURE 4-7.
LONG-TERM EMISSIONS FROM BLM AND NON-BLM SOURCES IN THE PLANNING AREA UNDER ALTERNATIVE D



BLM emissions include emissions from multiple resources, including BLM-authorized oil and gas emissions. Non-BLM emissions include emissions from oil and gas activities on state and private mineral estate.

**FIGURE 4-8.
LONG-TERM EMISSIONS FROM BLM AND NON-BLM
SOURCES IN THE PLANNING AREA UNDER ALTERNATIVE E**



**BLM emissions include emissions from multiple resources, including BLM-authorized oil and gas emissions.
Non-BLM emissions include emissions from oil and gas activities on state and private mineral estate.**

SOILS

Important components of the soil system include physical properties (e.g., bulk density, texture, structure, parent material, and porosity), chemical properties (e.g., pH, salts, calcium carbonate, clay, and humus), and biotic properties (e.g., microorganisms, macroorganisms, and organic matter). All of the components of the soil system directly relates to soil health and functionality.

Soil health and functionality is related to many factors, including but not limited to, vegetative ground cover, soil organic matter, porosity, fertility, resistance to erosion, and texture. In a natural state these functioning soils sustain biotic productivity and maintain water and air quality. The management actions which result in increasing bare ground, compaction of soil or removal of the soil have a direct adverse impact to soil health. The disturbance of the existing soil horizons and the removal of vegetation results in a direct degradation of soil functionality.

This loss of functionality can result in indirect adverse impacts to other resources. For example the removal of vegetative cover can result in an impact to water quality due to sediment delivery to water or increase the difficulty of establishing vegetation due to increase compaction or decreased porosity. Although those impacts could occur to other resources, the resource specific (e.g. water quality) impacts are addressed in the resource specific section and not this section.

Short-term impacts occur to soil resources when surface disturbing activities occur on the landscape and before final restoration activities are implemented. Therefore, the amount of bare ground assumed under all of the disturbance factors result in short-term adverse impacts to soil health and functionality. There is a difference in the long-term impacts to soil resources on the type of surface disturbing activity (resource benefit vs. resource use).

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in this impact analysis include the following:

- Proposed future surface disturbing activities would be required to meet the goals and objectives in

Chapter 2, *Soils*.

- The application of best management practices or mitigation and conservation actions to surface disturbing activities would reduce the adverse impacts to soil resources, but would not eliminate these impacts (e.g. hydraulic fracturing).
- As slopes approach 30 percent, the risk of soil instability following disturbance increases, particularly if cover, structure, permeability, or bulk density has been altered (Monsen et al. 2004).
- Reclamation suitability is low and probability of success is reduced on slopes greater than 20 percent (Monsen et al. 2004).
- Soils with high erodibility have a significantly lower probability of success for reclamation than soils with less erosion potential.
- It is impossible to predict when or where the surface disturbance would occur within the planning area; therefore unless the surface use is not allowed then it is assumed disturbance on sensitive soils, badlands, or rock outcrops would occur.
- The greater the long-term surface disturbing activity equals to the greater the adverse impacts to soil resources.
- The cause of impact to soil resources is insignificant in terms of impacts for the short-term, but is significant for impacts to soil resources in the long-term.
- Within 2 to 5 years of reclamation, vegetative cover and rates of erosion would return to pre-disturbance conditions (BLM 2008g). Exceptions to this timeline would include sites poorly suited to reclamation, which would require unconventional or site-specific reclamation measures.
- Areas of bare ground with an applied surface (e.g. gravel roads, oil and gas pads) are more susceptible to wind and water erosion than areas in a natural state.
- Acres utilized in impact comparison analysis are only estimates and not a predictor of future events due to factors outside the control of the BLM (e.g. economic factors).
- Areas of concentrated open off-highway vehicle results in compaction, accelerated erosion, and reduced ground cover, infiltration, nutrient cycling, and organic matter (BLM 2003m; Bainbridge 2007), particularly in areas of highly erodible soils. Off-highway-vehicle use on slopes greater than 25 percent would have a severe risk of accelerated water erosion (NRCS 1998).
- Acre figures and other numbers used in this analysis are approximate projections for comparison and analytical purposes only and reflect acres of surface disturbance from BLM authorized activities. Readers should not infer that they reflect exact measurements or precise calculations.
- GIS analysis is based on a 1:24,000-scale 2009 Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (also known as SSURGO) for each county in the planning area. Acre figures in all tables, except where noted, may overlap, and adding these figures will not result in accurate total acreage values.

IMPACTS COMMON TO ALL ALTERNATIVES

Management actions that promote organic soil carbon storage would inherently improve soil health and functionality by increasing vegetative ground cover, soil development, soil organic matter, fertility, water-holding capacity, and by reducing soil loss from wind and water erosion. Various ecosystem processes are influenced by the carbon cycle; therefore, management of soil carbon would affect other ecosystem processes, such as nutrient and water cycles. In addition, management actions that maintained or improved habitat would promote organic soil carbon storage. For example, applying a rest-rotation regime in order to enhance vegetative carbon stocks would also increase soil carbon stocks. Reclaiming or improving existing degraded areas would also improve organic carbon stocks in soils.

Surface-disturbing management actions would result in reduced ground cover or soil mixing, compaction, or removal; exposure of the soil resource to accelerated wind and water erosion; and the irretrievable loss of topsoil and nutrients. This disturbance would also change soil structure, heterogeneity (variable characteristics), temperature regimes, nutrient cycling, biotic richness, and diversity.

Surface disturbing activities, which result in soil compaction, would increase in bulk density and reduce porosity, infiltration, moisture, air, nutrient cycling, productivity, and biotic activity (Logan 2001; Perrow and

Davy 2003; Bainbridge 2007). Altering such characteristics would reduce the soil system's ability to adapt to climate change and withstand future disturbances.

Soils would take decades to hundreds of years to recover from the impacts of altered pH and reduced soil stability, organic matter content, microbial mass, biotic richness and diversity, and phosphorus and nitrogen content (Perrow and Davy 2003). This soil recovery timeframe following disturbance would be accelerated by mitigation and reclamation within all alternatives and reduce natural recovery rates to within several decades (Perrow and Davy 2003).

Where soil resources exist in their natural undisturbed state, management actions that prohibited surface-disturbing activities would provide for the maintenance of soil functionality by eliminating anthropogenic impacts. Although conversely, this same prohibition would result in the inability to conduct resource benefit anthropogenic activities, which would result in decreased soil functionality where soil resources exist in a disturbed state (e.g. riparian improvement projects on a degraded system).

Where surface disturbance is authorized, the application of best management practices and reclamation standards across all alternatives would provide for sustainable land use methods or relocation of the surface-disturbing activity to a more suitable soil type.

Soils health and functionality would be maintained or improved with fuels management treatments, since these treatments would reduce the intensity and severity of wild and prescribed fire (Arno and Allison-Bunnell 2002; Perrow and Davy 2003).

Meeting Rangeland Health Standards would maintain soil health, as Standards for Riparian Functionality and Upland Health promote soil biota, stability, nutrient cycling, and water storage. Maintaining proper functioning condition for riparian and wetland areas would sustain soil stability and hydric function on approximately 110,000 acres of hydric soils, which is 4 percent of the planning area. In addition, following and implementing the Guidelines for Livestock Management would conserve and protect soil resources, since these guidelines provide management options to improve soil health and functionality.

Resource management actions that maintain, conserve, or improve vegetation conditions including managing for PFC, riparian buffers, forest resilience, special status species plants, and range improvements, or wildlife habitat would promote natural soil structure and function. Although some treatments would cause surface disturbance and adverse impacts in the short-term, such treatments would provide beneficial impacts through promoting nutrient cycling, soil development, soil biodiversity, and site stability in the long-term. Table 4-19 shows how management actions related to oil and gas leasing and development would affect acres of soil resources maintained (i.e., closed or NSO stipulation), conserved (i.e., CSU stipulation), or at risk of degradation (i.e., open with no restrictions).

Using an integrated approach for controlling invasive vegetation species (e.g., weed-free forage; vehicle washing; and mechanical, biological, and chemical control) would promote a natural soil system. Although soil disruption from treatments would cause short-term, localized impacts, the treatment would promote long-term soil health (up to approximately 5,000 acres disturbed in the short-term and 50,000 acres in the long-term).

Coal extraction and the associated removal and replacement of overburden would cause surface disturbance and depress surface elevation, which would alter soil-water relationships on an assumed total of 8,715 BLM administered surface acres during the life of the plan. Coal development would be mitigated by a screening process that included sensitive soils in the unsuitability criteria (see the *Minerals Appendix* for further discussion of the screening process).

Closing areas where a type of off-highway vehicle use is causing considerable degradation to soil resources until the effects are eliminated would provide protection from further degradation, since the management action has measures to prevent reoccurrence.

**TABLE 4-19.
BLM-ADMINISTERED OIL AND GAS MINERAL ACRES OF SOIL RESOURCES PROTECTED, MAINTAINED, OR AT RISK OF DEGRADATION FROM OIL AND GAS SURFACE DISTURBANCE**

		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Resources Maintained	Sensitive Soils	21,280[1]	1,861,356	21,280[1]	21,280[1]	21,280[1]
	Badlands and Rock Outcrops	38,267[1]	272,514	38,267[1]	38,267[1]	272,514
Resources Conserved	Sensitive Soils	160,593	-	1,840,076	1,840,076	1,840,076
	Badlands and Rock Outcrops	-	-	243,247	243,247	-
Resources at Risk of Degradation	Sensitive Soils	1,840,076	-	-	-	-
	Badlands and Rock Outcrops	234,247	-	-	-	-

[1] – acres closed to oil and gas development (Wilderness Study Areas - nondiscretionary closures)

ALTERNATIVE A (No Action)

Summary Statement

All of the surface disturbing activities proposed under Alternative A are assumed to result in 75,000 acres surface disturbance or in approximately 2.7% of the BLM-administered surface acres (See *Disturbance Appendix*). Since it is improbable to predict where the surface disturbance would occur, Alternative A manages surface disturbance through the application of slope restrictions ranging from 15% to 30% or avoidance language for other land disturbing activities. There are no management actions which would provide for the consideration of the erodible sensitive soils. In addition, there are no protection measures for badlands or outcrops that are unsuitable for disturbance.

All alternatives provide certainty that the *Reclamation Appendix* and the *Mitigation Measures and Conservation Actions Appendix* are applied to all surface disturbing activities. This application would reduce the impacts to soil resources, increase the reclamation success and provide for adaptive management required to address the variation of soil types in the planning area.

Resources

Overall, the combination of all the BLM authorized resource benefit driven surface disturbances would result in reduced ground cover or soil mixing, compaction, or removal; exposure of the soil resource to accelerated wind and water erosion; and the irretrievable loss of topsoil and nutrients in the short-term on 48,000 acres. This would result in the short-term change in soil structure, heterogeneity (variable characteristics), temperature regimes, nutrient cycling, biotic richness, and diversity. Mixed soils would have decreased bulk density and altered porosity, infiltration, air-water relationships, salt content, and pH (Perrow and Davy 2003; Bainbridge 2007).

While there are adverse short-term impacts to soils from assumed resource surface disturbance, there are beneficial long-term impacts to soil resources from these disturbances. This is a result of the management actions designed to maintain, conserve, or improve vegetation conditions (including managing for PFC; water, riparian, or wildlife improvement projects or fuels management which results in natural disturbance regimes) which in turn promotes natural soil structure and function. Therefore these resource benefit disturbances would promote nutrient cycling, soil development, soil biodiversity, and site stability in the long-term.

The fuels management treatments mentioned above would reduce the intensity and severity of wild and prescribed fire. However, this alternative requires that in areas identified as Fire condition class 3 (53,000 acres) pre-commercial or commercial fuels material will be removed or treated prior to prescribed fire treatment activities. This requirement under current management would cause unnecessary degradation of the soil resource. In addition, inhibiting wildfire to meet multiple objectives on approximately 2.1 million BLM-administer acres would decrease the promotion of natural soil development within those areas.

Another specific vegetation management treatment is the control of invasive species. Within Alternative A surface disturbing actives would occur in areas of known invasive species without consideration of control of spread of the invasive species. This would result in an adverse impact to soil health and functionality, as invasive species are detrimental to reclamation efforts.

Resource Uses

As stated above in the resource impacts section, resource uses which results in surface disturbance would result in the same soil resource short-term adverse impacts on 27,000 acres. Although, the major difference is that the resource uses would result in 12,000 acres of long-term adverse impacts to soils. For example the construction of facilities (e.g. highways, roads, pads) results in long-term alteration of the natural biotic community and therefore results in decreased soil functionality. Even though this decrease is mitigated through the certainty in the application of best management practices long-term adverse impacts are not eliminated.

Within this alternative, oil and gas leasing and possible development on slopes greater than 30 percent would require mitigation to ensure sustainable use of the soil resource through the application of a controlled surface use stipulation. The specific mitigation requirement for soils is a BLM approved engineering and reclamation plan that demonstrates the maintenance of soil functionality. This would provide for the conservation of those areas defined in the above management action.

The only other soil resource restriction management action within this alternative includes the management of mechanical treatments. Mechanical treatments of vegetation on slopes greater than 15 percent and highly erodible soils would require mitigation to ensure sustainable use of the soil resource. Although these stipulations or restrictions are applied, as slopes approached 30 percent, the risk of soil instability following disturbance would increase and reclamation suitability would be low for slopes greater than 20 percent. Therefore without the consideration of other factors (i.e. erodibility), there is a significant increase in lack of successful reclamation when slopes above 20% are disturbed within Alternative A.

All resource uses surface disturbing actions (e.g. oil and gas; rights-of-way, range improvement projects, etc.) on sensitive soils with a high degree of erodibility potential would be managed for soil considerations through lease terms for oil and gas leasing or with applied mitigation through the environmental process. Due to this situation, sensitive soils with a high degree of erodibility potential would not be protected and therefore susceptible to degradation from resource uses. Since BLM is unable to predict where the acres of resource use disturbance would occur within this alternative, there is no certainty that conservation measures would be or could be implemented for the conservation of these types of soils.

Not contained within the previous discussions for this alternative is the authorization of livestock grazing on BLM-administered lands. This alternative differs in how grazing use is permitted when vegetation is removed due to another permitted use (e.g. mining, oil and gas development) and acres unavailable for livestock grazing. As the land is dedicated to coal mining, BLM authorized grazing use is suspended and therefore soil resources are protected from increased intensity of livestock grazing (8,700 BLM-administered acres). While with oil and gas or locatable minerals development, the permitted use is not suspended when the vegetation is eliminated for

development. Instead livestock permitted use is not changed in these instances, as long as Rangeland Health Standards are met on the grazing allotment. This would result in increased intensity of livestock grazing on the surrounding lands. There would be no certainty that soil resources would be protected from degradation from the increased intensity unless Rangeland Health Standards are compromised; and therefore soil health would be compromised on approximately 7,400 acres of BLM-administered lands.

In addition to the reduction of surface-disturbing activities, Alternative A results in 240 acres of BLM administered lands unavailable for livestock grazing. This management action would result in a beneficial impact to soil functionality in areas of livestock congregation (e.g. around watering locations). However, there would be a long-term adverse impact to soil functionality and health through this reduction of the BLM grazing use due to a decrease in soil productivity and biotic properties.

Also, in relation to livestock grazing is the management of permitted use following wildfire or prescribed fire. This alternative provides for deferring grazing for at least 1 growing season following fire within the Big Dry RMP area or temporarily closing grazing in the Powder River RMP Area. These management actions would not provide for conservation and protection necessary for soil resources following fire as they are simply a time restriction without any measureable soil resource considerations.

Lastly, concerning livestock grazing is the transfer of grazing permits or leases on a case-by-case basis. While this management action appears to only provide an administrative methodology for the transfer of grazing permits or leases, the management action does have implications to soil resources. A case-by-case methodology only requires the application for Standards for Rangeland Health and consideration of the allotment grazing categorization. The process does not address ever changing or evolving resource considerations and therefore does not provide for the opportunistic management of vegetative resources; therefore not providing for the opportunistic conservation or protection of soil resources.

Areas of concentrated open off-highway vehicle use (2,400 BLM-administered acres) would result in reduced soil health and functionality. Additionally, there would be decreased integrity to soil health on 2000 acres of sensitive soils and 69 acres of slopes over 25% within the open off-highway vehicle areas due to accelerated water erosion.

Special Designations

The restriction of a specific resource use (e.g. rights-of-way) in special designations is already factored into the resource use discussion above and is therefore already considered in the analysis. The only remaining management action in special designations, which has applicability to soil resources, is the consideration of closing the area to current and any future off-highway vehicle use. Through the application of this management action, this alternative would provide for the protection of 80 acres of soil resources.

ALTERNATIVE B

Summary Statement

Alternative B is the most restrictive alternative and results in surface-disturbing activities not being allowed on approximately 80% of BLM administered lands (approximately 2.1 million acres). All of the surface disturbing activities proposed under Alternative B are assumed to result in 36,000 acres of surface disturbance or approximately 1.3% of the BLM-administered surface acres (See *Disturbance Appendix*). Therefore in consideration of resource uses, this alternative offers greatest level for soil resource conservation or protection when compared to all alternatives.

This alternative, when compared to Alternative A, provides substantial protection to erodible sensitive soils, rock out crops, and badlands from oil and gas development or other surface-disturbing activities. However, Alternative B considerably prohibits other resource program restoration projects (e.g. water, fuels, vegetation, and the implementation of guidelines for livestock management), which would not be beneficial to soil conservation or protection.

All alternatives provide certainty that the *Reclamation Appendix* and the *Mitigation Measures and Conservation Actions Appendix* are applied to all surface disturbing activities. This application would reduce the impacts to soil resources, increase the reclamation success and provide for adaptive management required to address the variation of soil types in the planning area.

Resources

Overall, the impacts described in *Alternative A- Resource Impacts* would be the same as for Alternative B. The noticeable difference is there is 30,000 acres less of assumed resource benefit surface disturbance as when compared to Alternative A. This would correspond to an approximate 61% reduction in the short-term adverse impacts and the same reduction of the long-term beneficial impacts for the implementation of resource benefit projects when compared to Alternative A.

While the above paragraph is in specific relationships to resource benefit projects, there is a broader adverse impact to soil resources from restricting the surface disturbing activities at this scale. The most notable impact is to the fuels and vegetation management actions as Alternative B provides very limited opportunity to implement fuels reduction projects, implement vegetation treatments (including invasive species), or provide control opportunities for invasive species. At this scale there would be a decline in soil functionality and health on approximately 2.1 million BLM administered acres over the long-term.

Resource Uses

Resource uses impacts within Alternative B, is assumed to occur on 17,000 acres, which is approximately 36% less than Alternative A. This also correlates to an estimated long-term impact to 8,300 acres, which is 33% less than Alternative A. Since Alternative B does not allow any surface disturbing activities on badlands and outcrops, these areas would receive the highest level of protection within this alternative.

Slopes and soil erodibility are proactively managed within this alternative for oil and gas development, as well as other resource uses. For oil and gas, Alternative B would provide a NSO stipulation that considers a combination of slope and erodibility of the soils. All other resource use surface disturbing activities would also have the same consideration as oil and gas (prohibited surface use).

Since both sensitively and erodibility are considered in all situations, Alternative B would provide greater conservation of soil productivity, soil stability, and soil biotic properties when compared to Alternative A. In addition, this alternative would also decrease the adverse impacts of excessive erosion, potential mass wasting and at the same time increase the likelihood of successful reclamation when compared to Alternative A.

In addition to the reduction of surface-disturbing activities, Alternative B results in 210,000 acres of BLM administered lands unavailable for livestock grazing. This management action would result in a beneficial impact to soil functionality in areas of livestock congregation (e.g. around watering locations). However, there would be a long-term adverse impact to soil functionality and health through this reduction of the BLM grazing use due to a decrease in soil productivity and biotic properties.

Differing from Alternative A in terms of livestock grazing use, there are management actions which would result in the suspension of permitted use from coal mining and oil and gas development (11,000 acres). This management action would provide for the conservation of soil resources through the maintenance of the current intensity of the livestock grazing use when the respective resource uses are permitted. However, locatable mine areas are only excluded from livestock grazing (4,000 acres) within the area of an active mine, but there is no management actions for suspending the grazing use to manage the mine area during the reclamation phase of the mine activity. This would result in the same impact to soil resources as described in Alternative A in regard to suspending grazing use in areas of locatable mining. None of the above management actions concerning suspending livestock grazing use during coal, locatable or oil and gas development provide certainty on how the livestock grazing use would be reactivated and therefore do not provide certainty for the protection of soil resources.

Alternative B, very similar to Alternative A, also provides a management action for the suspension of permitted use following wildfire or prescribed fire. This alternative provides for suspending grazing use for at least 2 growing seasons. Identical to the analysis within Alternative A, this management action would also not provide for conservation and protection necessary for soil resources following wildfire or prescribed fire as they are simply a time restriction without any measureable soil resource considerations for determining when livestock grazing would occur.

Also within Alternative B is the management action for the transfer of custodial grazing permits or leases when there is no change in kind of livestock or permitted use and when documentation provides the grazing allotment meets Standards for Rangeland Health. While this management action appears to only provide an administrative methodology for the transfer of custodial grazing permits or leases, the management action does have implications to soil resources. Identical to Alternative A, this methodology requires the application for Standards for Rangeland Health and consideration of the allotment grazing categorization. This does not address evolving resource considerations on improve or maintain allotments and does not consider the other relevant factors, such as season of use. Therefore, this does not provide for the opportunistic management of vegetative resources and does not provide for the opportunistic conservation or protection of soil resources.

Differing from Alternative A, there are no areas of concentrated open off-highway vehicle use within Alternative B and therefore there would not be an impact to soil health and functionality from this activity. When compared to Alternative A, this means 2,400 more acres of soil resources would be conserved and protected within Alternative B.

Special Designations

The restriction of a specific resource use (e.g. rights-of-way) in special designations is already factored into the resource use disturbance and is therefore already considered in the above discussions. The only remaining management action in special designations, which has applicability to soil resources, is the consideration of closing the area to current and any future off-highway vehicle use. Through the application of this management action, this alternative would provide for the protection of 63,841 BLM administered acres of soil resources, which is 63,761 acres greater than in Alternative A.

ALTERNATIVE C

Summary Statement

All of the surface disturbing activities proposed under Alternative C are assumed to result in 73,000 acres surface disturbance or on approximately 2.7% of the BLM-administered surface acres (See *Disturbance Appendix*). This is an increase of 1,700 acres when compared to Alternative A and an increase of 37,000 acres when compared to Alternative B.

In comparison to Alternative A, Alternative C management actions provides greater protection for erodible sensitive soils, rock out crops, and badlands from oil and gas development or other surface-disturbing activities. However in comparison to Alternative B, Alternative C provides lesser constraints in the management actions concerning surface disturbing activities on sensitive soils, rock outcrops and badlands.

All alternatives provide certainty that the *Reclamation Appendix* and *Mitigation Measures and Conservation Actions Appendix* are applied to all surface disturbing activities. This application would reduce the impacts to soil resources, increase the reclamation success and provide for adaptive management required to address the variation of soil types in the planning area.

Resources

Overall, the impacts described in *Alternative A- Resource Impacts* would be the same as for Alternative C. The minor difference is there is 890 BLM administered acres less of assumed resource surface disturbance as when compared to Alternative A. This would correspond to an approximate 1.3% reduction in the short-term adverse

impacts and the same reduction of the long-term beneficial impacts for the implementation of other resource projects when compared to Alternative A.

In relation to specific vegetation management actions, there are differences between Alternative A and Alternative C. Alternative C does not prescript pre-commercial removal or treatment of fuels materials; therefore there would be a beneficial impact to 53,000 more acres than when compared to Alternative A. Lastly, this alternative allows the use of wildfire to meet multiple objectives on BLM-administer lands and therefore would increase the promotion of natural soil development within those areas.

In relation to Alternative B, there is a noticeable difference in comparison to Alternative C. The difference would be that 29,000 more BLM administered acres are assumed to be disturbed by resource programs than in Alternative B. This would correspond to an approximate 60% increase in the short-term adverse impacts and the same increase of the long-term beneficial impacts for the implementation of other resource projects when compared to Alternative B.

In relation to one specific vegetation management action, there is a difference in Alternative C when compared to Alternatives A and B. Alterative C also allows disturbance in areas of invasive species with an approved mitigation plan. This would allow the proactive treatment of invasive species and improve soil health and functionality.

Resource Uses

Resource uses impacts within Alternative C are assumed to occur on 26,000 acres. Since this alternative does provide a moderate constraint for surface disturbing activities (includes CSU for oil and gas and avoidance for other resource uses) on sensitive soils, badlands and outcrops, these areas would be offered greater conservation and protection than Alternative A. This is because both sensitivity and erodibility are considered in all situations and therefore Alternative C would provide greater conservation of soil productivity, soil stability, and soil biotic properties when compared to Alternative A. In addition, this alternative would also decrease the adverse impacts of excessive erosion, potential mass wasting and at the same time increase the likelihood of successful reclamation when compared to Alternative A.

Comparing the same management actions listed above for Alternative C to Alternative B, there is the same level of conservation and management of sensitive soils, since an exception could only be granted if the proponent demonstrated the proposed action would not contribute to the degradation of sensitive soil resources. However, the management action in Alternative C for badlands and outcrops provides less conservation and protection measures when compared to Alternative B. It is expected that there would be reclamation failures on badlands or outcrops within this Alternative.

In addition to the reduction of surface-disturbing activities, Alternative C results in 3,700 acres of BLM administered lands being unavailable for livestock grazing. This is approximately 94% more acres when compared to Alternative A and approximately 98% less acres than Alternative B. The short-term beneficial impact and long-term adverse impacts to soil resources would also respectively reflect the above percentages.

Differing from Alternative A and Alternative B in terms of livestock grazing, there are management actions which would result in the suspension of permitted use from coal mining, locatable mining, and oil and gas development (16,000 acres). This management action would provide for the conservation of soil resources through the maintenance of the current intensity of the livestock grazing when the respective resource uses are permitted. A difference between Alternative C and the two previous alternatives (A and B) is that that management actions provide certainty through the application of Standards for Rangeland Health on how the livestock grazing permitted use would be reactivated and therefore would provide certainty for the conservation and protection of soil resources.

When compared to Alternative A and B, Alternative C also differs in terms of the activation of livestock grazing permitted use following wildfire or prescribed fire events. Alternative C does not contain a time element and instead focuses on activating livestock grazing based on vegetation objectives. This alternative

would provide minimal beneficial impacts to soil resources as vegetation is just one aspect of soil health and functionality.

Also within Alternative C is the management action for the transfer of custodial and maintain grazing permits or leases when there is no change in the kind of livestock or permitted use and when documentation provides the grazing allotment meets Standards for Rangeland Health. While this management action appears to only provide an administrative methodology for the transfer of custodial grazing permits or leases, the management action does have implications to soil resources. Identical to Alternative A, this methodology requires the application for Standards for Rangeland Health and consideration of the allotment grazing categorization. This does not address evolving resource considerations on improve allotments and does not consider the other relevant factors, such as season of use. Therefore, this does not provide for the opportunistic management of vegetative resources and does not provide for the opportunistic conservation or protection of soil resources.

In terms of concentrated open off-highway vehicle use areas, Alternative C results in 640 acres being available for this type of use. This is a 1,700 acre decrease in available acres when compared to Alternative A, but a 640 acre increase in available acres when compared to Alternative B. In addition, the area of open off-highway vehicle use within Alterative C would result in decreased integrity to soil health 480 acres of sensitive soils and 2 acres of slopes over 25% due to accelerated water erosion.

Special Designations

The restriction of a specific resource use (e.g. rights-of-way) in special designations is already factored into the resource use disturbance and is therefore already considered in the above discussions. The only remaining management action in special designations, which has applicability to soil resources, is the consideration of closing the area to current and any future off-highway vehicle use. Through the application of this management action, this alternative would provide for the protection of 550 BLM administered acres of soil resources. This is 470 more acres than Alternative A and 63,291 less acres than Alternative B.

ALTERNATIVE D

Summary Statement

All of the surface disturbing actives proposed under Alternative D are assumed to result in 80,000 acres of surface disturbance or in approximately 2.8% of the BLM-administered surface acres (See *Disturbance Appendix*). This is an increase of 4,800 acres when compared to Alternative A; 44,000 acres more when compared to Alternative B and 6,500 acres more when compared to Alternative C.

In comparison to Alternative A, Alternative D management actions provides greater protection for erodible sensitive soils, rock out crops, and badlands from oil and gas development or other surface-disturbing activities. However, Alternative D provides lesser constraints by providing a CSU (oil and gas leasing) and avoiding surface disturbing activities on sensitive soils, rock outcrops and badlands; when compared to Alternative B management actions which provides a NSO (oil and gas leasing) and do not allow surface disturbing activities on sensitive soils, rock outcrops and badlands. Lastly, in comparison to Alternative C, Alternative D management actions for the management, conservation or protection for erodible sensitive soils, rock out crops, and badlands from oil and gas development or other surface-disturbing activities are identical; therefore impact comparisons are identical to Alternative C.

All alternatives provide certainty that the *Reclamation Appendix* and the *Mitigation Measures and Conservation Actions Appendix* are applied to all surface disturbing activities. This application would reduce the impacts to soil resources, increase the reclamation success and provide for adaptive management required to address the variation of soil types in the planning area.

Resources

Overall, the impacts described in *Alternative A- Resource Impacts* would be the same as for Attentive D. The minor difference is there is 290 BLM administered acres less of assumed resource surface disturbance as when

compared to Alternative A. This would correspond to a less than 1% reduction in the short-term adverse impacts and the same reduction of the long-term beneficial impacts for the implementation of other resource projects when compared to Alternative A.

In relation to Alternative B, there is a difference in comparison to Alternative D. The difference would be that 30,000 more BLM administered acres are assumed to be disturbed by resource programs than in Alternative B. This would correspond to an approximate 62% increase in the short-term adverse impacts and the same increase of the long-term beneficial impacts for the implementation of other resource projects when compared to Alternative

In relation to Alternative C, there is a minor difference in comparison to Alternative D. The difference would be that 1,200 more BLM administered acres are assumed to be disturbed by resource programs than in Alternative B. This would correspond to a less than 2% increase in the short-term adverse impacts and the same increase of the long-term beneficial impacts for the implementation of other resource projects when compared to Alternative D.

Resource Uses

Resource uses impacts within Alternative D are assumed to occur on 32,000 acres. The management actions for the resources uses occurring on these acres within Alternative D very closely resembles the management actions contained within Alternative C. The only difference in the management actions between Alternative C and Alternative D that has not already been discussed is the acres proposed to be unavailable to livestock grazing, the management of livestock grazing after wildfire or prescribed fire, the acres available for open off-highway vehicle use, and the acres closed in special designations to current and future off-highway vehicle use. Therefore, only these alternatives are discussed in this section. Please refer to the impact analysis under Alternative C – Resource Impacts to Soils for discussion related to all other management actions.

In relation to acres unavailable for livestock grazing, the short-term beneficial impact discussed in Alternative A and long-term adverse impacts discussed in Alternative A would have the same applicability to this Alternative. The only difference in the amount of area the impact analysis pertains to as Alternative D results in 100 acres of BLM administered lands unavailable for livestock grazing. This is 140 less acres when compared to Alternative A, 209,000 less acres than Alternative B, and 3,600 less acres than Alternative C.

When compared to Alternative A and B, Alternative D differs slightly in terms of the activation of BLM livestock grazing use following prescribed or wildfire events. Alternatives A (1 year rest or temporarily unavailable), Alterative B (minimum 2 year rest) and Alterative D (until seed set) are all similar in that the management actions are just a time element in relation when to activate livestock grazing. Alternative D mimics the analysis in regard to BLM grazing use after fire for Alternatives A, B, and C, as this alternative also does not provide for the conservation of soil resources because it does not consider soil resources as a factor in when to activate livestock grazing.

When compared to Alternative C, Alternative D differs in terms of the activation of livestock grazing following prescribed or wildfire events. Alternatives C provides for attainment of vegetation objectives prior to activation of livestock grazing, while Alterative D activates livestock grazing once seed set is obtained. Therefore Alternative D provides less protection to soils resources than Alternative C and does not provide for the conservation of soil resources, as it does not consider soil resources as a factor in when to activate livestock grazing

Also within Alternative D is the management action for the transfer of custodial, improve, or maintain grazing permits or leases when there is no change in the kind of livestock or permitted use and when documentation provides the grazing allotment meets Standards for Rangeland Health. While this management action appears to only provide an administrative methodology for the transfer of custodial grazing permits or leases, the management action does have implications to soil resources. Identical to the other alternatives, this methodology requires the application for Standards for Rangeland Health and consideration of the allotment grazing categorization. This does not address evolving resource considerations or other relevant factors, such as

season of use. Therefore, this does not provide for the opportunistic management of vegetative resources and does not provide for the opportunistic conservation or protection of soil resources.

In terms of concentrated open off-highway vehicle use areas, Alternative D results in 2,000 acres being available for this type of use. This is a 400 acre decrease in available acres when compared to Alternative A, a 2,000 acre increase in available acres when compared to Alternative B, and a 1,400 acre increase in available acres when compared to Alterative C. Therefore in comparison to alternative A, there would be a decrease in the adverse impacts to soil resources because of reduced adverse impacts to soil health and functionality. Conversely there would be an increase comparison to Alternative B and Alternative C for the adverse impacts to soil resources because of reduced soil health and functionality. In addition, the area of open off-highway vehicle use there would be decreased integrity to soil health 1,700 acres of sensitive soils and 56 acres of slopes over 25% due to accelerated water erosion.

Special Designations

The restriction of a specific resource use (e.g. rights-of-way) in special designations is already factored into the resource use disturbance and is therefore already considered in the above discussions. The only remaining management action in special designations, which has applicability to soil resources, is the consideration of closing the area to current and any future off-highway vehicle use. Through the application of this management action, this alternative would provide for the protection of zero (0) BLM administered acres of soil resources. When compared to Alterative D, this is reductions of 80 acres for Alternative A, reduction of 63,841 acres for Alternative B and reduction of 550 acres for Alterative C. These reductions would correlate to an increase of potential adverse impacts to soils health due to reduced acres of off-highway vehicle closures.

ALTERNATIVE E (Proposed)

Summary Statement

All of the surface disturbing activities proposed under Alternative E are assumed to result in 79,000 acres of surface disturbance or in approximately 2.9% of the BLM-administered surface acres (See *Disturbance Appendix*). This is an increase of 4,300 acres when compared to Alternative A; 44,000 acres more than assumed in Alternative B, 6,000 acres more than assumed in Alternative C and 530 acres less than assumed in Alternative D.

In comparison to Alternative A, Alternative E management actions provide greater protection for erodible sensitive soils, rock out crops, and badlands from oil and gas development or other surface-disturbing activities. However, Alternative E provides lesser constraints by providing a CSU (oil and gas leasing) and avoiding surface disturbing activities on sensitive soils when compared to Alternative B management actions which provides a NSO (oil and gas leasing). But Alternatives B and E both prescribe a NSO for oil and gas leasing on rock outcrops and badlands.

In comparison to Alternatives C and Alternative D, this alternative provides the same management action for the conservation of erodible sensitive soils since both erodibility and slope are considered. However, Alternative E differs in the management of badlands and rock outcrops in regards to the resource use when compared to Alternatives C and D. Alternative E provides a greater level of protection for rock out crops, and badlands from oil and gas development or other surface-disturbing activities through the management of NSO for oil and gas leasing; whereas Alternative C and D utilize as CSU. Other resource uses outside of oil and gas development are managed that same in Alternatives C, D, and E with the application of design features to maintain or improve the stability of badlands and rock outcrops.

All alternatives provide certainty that the *Reclamation Appendix* and the *Mitigation Measures and Conservation Actions Appendix* are applied to all surface disturbing activities. This application would reduce the impacts to soil resources, increase the reclamation success and provide for adaptive management required to address the variation of soil types in the planning area.

Resources

Overall, the impacts described in *Alternative A- Resource Impacts* would be the same as for Attentive E. There are differences in assumed acres of disturbance from resource benefit surface disturbances between alterative E and the other alternatives. In relation to Alternatives A (410 acres more assumed acres), Alternative C (1,300 more assumed acres), and Alternative D (130 more assumed acres), the change in acres is the only measurable impact to soil resources for Alternative E beyond what is described in the other above mentioned alternatives.

In relation to Alternative B, there is a difference in comparison to Alternative E. The difference would be that 30,000 more BLM administered acres are assumed to be disturbed by resource programs than in Alternative B. This would correspond to an approximate 61% increase in the short-term adverse impacts and the same increase of the long-term beneficial impacts for the implementation of other resource projects when this alternative is compared to Alternative B.

Resource Uses

Resource uses impacts within Alternative E are assumed to occur on 32,000 acres. The other alternatives resource use surface disturbance acreage estimates are different from Alternative E in various amounts. In relation to Alternatives C and D, there is a very minor difference in the amount of expected acreage disturbance with 5,000 more acres assumed in Alternative E than in Alternative C; and 1,700 less acres of assumed disturbance than Alternative D.

For almost all of the management actions, Alternative E is a combination of all the other alternatives (see *Summary of Impacts Alternative E*). The only difference in the impacts analysis between the other alternatives and Alternative E that has not been already discussed is the acres proposed to be unavailable to livestock grazing, the management of livestock grazing after wildfire or prescribed fire, the acres available for open off-highway vehicle use, and the acres closed in special designations to current and future off-highway vehicle use. Therefore, only these management actions are discussed in this section.

In relation to acres unavailable for livestock grazing, the short-term beneficial impact discussed in Alternative A and long-term adverse impacts discussed in Alternative A would have the same applicability to this Alternative. The only difference in the amount of area the impact analysis pertains to as Alternative E results in 140 acres of BLM administered lands unavailable for livestock grazing. This is 100 less acres when compared to Alternative A, 210,000 less acres than Alternative B, 3,600 less acres than Alternative C; and 140 acres more than in Alternative D.

When compared to Alternative A, B and D, Alternative E is different in terms of the activation of BLM livestock grazing use following prescribed or wildfire events. Alternatives A (1 year rest or temporarily unavailable), Alterative B (minimum 2 year rest), and Alterative D (until seed set) are all similar in that the management actions are just a time element in relation when to activate livestock grazing. Alternative E does not have a time constraint, but instead relies on the Standards for Rangeland Health to make the determination of when livestock grazing would occur on BLM administered lands. In order for a determination to be made monitoring data would need to be collected and analyzed prior to the grazing use. This would provide certainty that soil resources would be conserved and protected as the standards for riparian functionality and upland health consider soil functionality and health.

When comparing Alternative C (vegetation objectives) to Alternative E (Standards for Rangeland Health), there is a difference in impacts to soil resources in terms of the activation of livestock grazing following prescribed or wildfire events. Alternative E provides for greater conservation of the soil resource due to the fact Standards for Rangeland Health determinations considers soil functionality; whereas Alternative C does not consider soil health or functionality.

Also within Alternative E is the management action for the transfer of grazing permits or leases through application of screening criteria and the Standards for Rangeland Health. While this management action appears to only provide an administrative methodology for the transfer of grazing permits or leases, the management action does have implications to soil resources. Different from the other alternatives, Alternative E addresses all

grazing allotments and does address evolving resource considerations or other relevant factors, such as season of use. Therefore, this alternative provides for the opportunistic management of vegetative resources and does provide for the opportunistic conservation or protection of soil resources.

In terms of concentrated open off-highway vehicle use areas, Alternative D results in zero acres being available for this type of use. This is a 2,400 acre decrease in available acres when compared to Alternative A, equal in comparison to Alternative B, 640 acre decrease in available acres when compared to Alterative C and a 2,000 acre decrease in comparison to Alternative D. Therefore in comparison to alternative A, C and D, there would be a decrease in the adverse impacts to soil resources because of reduced adverse impacts to soil health and functionality.

Special Designations

The restriction of a specific resource use (e.g. rights-of-way) in special designations is already factored into the resource use disturbance and is therefore already considered in the above discussions. The only remaining management action in special designations, which has applicability to soil resources, is the consideration of closing the area to current and any future off-highway vehicle use. Through the application of this management action, this alternative would provide for the protection of 2,800 BLM-administered acres of soil resources. When compared to the other alternatives this is: Alterative A (2720 increase of acres), Alternative B (64,041 reduction of acres); Alternative C (2,250 increase of acres); and Alternative D (2800 increase of acres).

CUMULATIVE IMPACTS

Historical and ongoing activities adjacent to or within the planning area include mineral exploration and development, livestock grazing, on- and off-road vehicle use, recreation, infrastructure development, fire suppression, altered fire regimes, forestry, urbanization, invasive vegetation species infestations, pollution, and agriculture. The cumulative effects of such activities have contributed to compaction, increased overland flow, mass movement, and accelerated erosion by wind and water and resulted in sedimentation and the irretrievable loss of topsoil and nutrients. Long-term impacts have included altered pH and reduced soil stability, organic matter content, microbial mass, biotic richness and diversity, and phosphorus and nitrogen content (Perrow and Davy 2003). Permanent impacts have included altered texture class, rock fragment content, structure, and depth to bedrock. Pre-existing disturbance regimes (e.g., fire) have been altered, which also altered natural rates of soil formation (Perrow and Davy 2003).

Beginning early in the 20th century, fire suppression (in conjunction with grazing, development, and nonnative vegetation) has altered natural fire regimes in eastern Montana (USFS and USDI 2007), resulting in altered soil development, nutrient cycling, and soil biodiversity. Recently, fuels treatments on lands within the planning area have reduced the intensity and severity of wild fire and resulted in the landscape trending toward a natural fire regime.

Although land management within watersheds contiguous to the planning area contributes to increased overland flow onto BLM-administered lands (leading to accelerated water erosion and sedimentation), soil conservation and improvement is a fundamental component of most management on lands adjacent to the planning area. Accelerated erosion from roads has been reduced with improved road construction and maintenance methods. Federal and state requirements for water quality have contributed to reductions in accelerated erosion and sedimentation. Federal and state air quality standards have contributed to fugitive dust control and reductions in atmospheric deposition of pollutants.

Invasive weed control on adjacent lands continues to protect soils from many nonnative species. Management actions that promoted organic soil carbon storage on adjacent lands would inherently reduce overland flow onto BLM-administered lands and would potentially alter water cycles and other ecosystem processes. Management of soil resources on lands adjacent to the planning area is expected to continue on the path of conservation and improvement, which would result in increased soil health and reduced accelerated erosion and sedimentation. Although surface-disturbing actions on BLM-administered lands would potentially occur, all land uses under all alternatives would meet the Standards for Rangeland Health. Alternatives vary in the amount of localized site-level impacts.

Alternative A (No Action)

The assessed resources, ecosystems, and human communities of concern are approaching conditions in which additional stresses associated with the proposed action and past, present, and future foreseeable actions would have cumulative effects. Alternative A would contribute to a decline in soil resource health and conservation. Within this alternative 120,000 acres of lands would be closed to resource benefit projects; 16,000 acres of soil resources would not be protected in areas of coal mining, locatable mining or oil and gas development because of increased livestock grazing intensity; 53,000 acres of soil resources would be at threat of adverse effects of wildfire events due to not being able to implement fuels treatments; 2,400 acres would of soil resources would be degraded in an open off-highway vehicle area; and 80 acres of soil resources would be protected from current and future off-highway vehicle use. Management actions proposed under Alternative A have historically led to areas that experienced downward trends for soil resources, moderate departures from natural fire regimes, and disturbances with poor reclamation potential.

When combined with expected land use and development on other ownerships we expect an increase in the potential for adverse soil cumulative effects. These effects include the potential for reduced soil health and functionality. The BLM contribution to this increased potential is relatively small as the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area.

Alternative B

The assessed resources, ecosystems, and human communities of concern are approaching conditions in which additional stresses associated with the proposed action and past, present, and future foreseeable actions would have cumulative effects. Alternative B would not allow resource uses or resource benefit surface disturbing actions on 2,200,000 acres. In addition, there would be zero acres available for open off-highway vehicle use and 64,000 acres closed to current and any future off-highway vehicle use. Within this alternative soil health and functionality on BLM-administered lands would improve in the short-term, but would decline in the long-term due to the inability to implement resource benefit projects.

When combined with expected land use and development on other ownerships we expect an increase in the potential for the protection soil resources as a cumulative effect. These effects include the potential for reduced impacts to soil health and functionality. The BLM contribution to this reduction is relatively small as the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area. However, since the BLM manages a relatively small portion of the analysis area we would still expect the cumulative amount of soil impacts to increase throughout time (although at a slower rate than Alternative A). These effects include the potential for reduced soil health and functionality.

Alternative C

The assessed resources, ecosystems, and human communities of concern are approaching conditions in which additional stresses associated with the proposed action and past, present, and future foreseeable actions would have cumulative effects. Alternative C would contribute to the continuing increase in sensitive soil resource health and conservation because many actions within Alternative C would require controlled management of surface uses and ground-disturbing actions, including those aimed toward ecological improvement. Consequently, Alternative C would provide for conservation of the sensitive soil resources. Conversely, areas of badlands and rock outcrops would decline in health and functionality because Alternative D would allow surface disturbing activities in these areas. Within this alternative 120,000 acres of lands would be closed to resource benefit projects; 16,000 acres of soil resources would be protected in areas of coal mining, locatable mining or oil and gas development because of maintenance of livestock grazing intensity; fuels project could be implemented within the landscape; 210,000 acres of badlands and outcrops would be susceptible to reclamation failures; 640 acres would of soil resources would be degraded in an open off-highway vehicle area; and 550 acres of soil resources would be protected from current and any future off-highway vehicle use.

When combined with expected land use and development on other ownerships we expect an increase in the potential for the conservation soil resources as a cumulative effect. These effects include the potential conservation of soil health and functionality. The BLM contribution to this conservation is relatively small as

the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area. However, since the BLM manages a relatively small portion of the analysis area it is expected the cumulative amount of soil impacts to increase throughout time (although at the slower rate than Alternative A). These effects include the potential for reduced soil health and functionality.

Alternative D

The assessed resources, ecosystems, and human communities of concern are approaching conditions in which additional stresses associated with the proposed action and past, present, and future foreseeable actions would have cumulative effects. Alternative D would contribute to the continuing increase in sensitive soil resource health and conservation because many actions within Alternative D would require controlled management of surface uses and ground-disturbing actions, including those aimed toward ecological improvement.

Consequently, Alternative D would provide for conservation of the sensitive soil resources. Conversely, areas of badlands and rock outcrops would decline in health and functionality because Alterative D would allow surface disturbing activities in these areas. Within this alternative 110,000 acres of lands would be closed to resource benefit projects; 16,000 soil resources would be protected in areas of coal mining, locatable mining or oil and gas development because of maintenance of livestock grazing intensity; fuels project could be implemented within the landscape; 210,000 badlands and outcrops would be susceptible to reclamation failures; 2,000 acres would of soil resources would be degraded in an open off-highway vehicle area; and no zero (0) acres would be protected from current and any future off-highway vehicle use.

Management actions proposed under Alternative D would result in improved soil health and conservation o on sensitive soils and result in decrease functionality for badlands/outcrops on BLM lands. When combined with expected land use and development on other ownerships we'd expect a slight reduction in the overall potential for adverse soil cumulative effects. However, since the BLM manages a relatively small portion of the analysis area (approximately 11%) we would still expect the cumulative amount of soil impacts to increase throughout time (although at the slowest rate of all alternatives). These effects include the potential for reduced soil health and functionality.

Alternative E (Proposed)

The assessed resources, ecosystems, and human communities of concern are approaching conditions in which additional stresses associated with the proposed action and past, present, and future foreseeable actions would have cumulative effects. Alternative E would contribute to the continuing increase in soil resource health and conservation because many actions under Alternative E would require controlled management of surface uses and ground-disturbing actions, including those aimed toward ecological improvement. Consequently, Alternative E would provide for conservation of soil resources. In addition Alternative E would maintain or improve the health and functionality of badlands and rock outcrops. Within this alternative 94,000 acres of lands would be closed to resource benefit projects; 16,000 acres of soil resources would be protected in areas of coal mining, locatable mining or oil and gas development because of maintenance of livestock grazing intensity; fuels project could be implemented within the landscape; 260,000 badlands and outcrops would be protected from reclamation failures; zero (0) acres would of soil resources would be degraded in an open off-highway vehicle area; and 2,800 acres would be protected from current and any future off-highway vehicle use.

Management actions proposed under Alternative E would result in improved soil health and conservation on BLM lands. When combined with expected land use and development on other ownerships we'd expect a slight reduction in the overall potential for adverse soil cumulative effects. However, since the BLM manages a relatively small portion of the analysis area (approximately 11%) we would still expect the cumulative amount of soil impacts to increase (although at the slowest rate of all alternatives). These effects include the potential for reduced soil health and functionality.

WATER RESOURCES

SURFACE WATER QUALITY

Adverse impacts to water quality are those that would result in a reduction in water quality or designated beneficial use of a waterbody. Management actions that allowed surface-disturbing activities that contributed to erosion and subsequent sediment delivery to a waterbody could result in adverse impacts if they resulted in such a reduction in water quality or beneficial use degradation (Pimentel and Kounang 1998). Beneficial impacts to surface water quality would result from management actions that directly improved water quality or that minimized, reduced, or prevented sediment flow into water. For example, watershed enhancement projects or vegetation treatments that stabilized or improved degraded portions of watersheds would beneficially impact surface water quality. Therefore, the more an alternative would limit surface-disturbing activities that result in adverse sedimentation or would limit the release of lower quality water, the more beneficial the impacts to water quality would be.

Direct adverse impacts to surface water quality would result from actions that degraded the quality of surface waters. For example, management actions that would modify streams (e.g., allowing open-cut stream or wetland crossings or allowing oil and gas development within waterbodies and streams) or the distribution and condition of riparian-wetland areas (e.g., allowing oil and gas development within riparian-wetland areas or allowing new livestock water developments in riparian-wetland areas) would result in direct adverse impacts to surface water quality.

Indirect impacts would result from actions that disturbed soil and vegetation in a watershed (e.g., allowing ROWs, oil and gas development, or prescribed fire in upland areas), leading to increased sedimentation of waterbodies.

Long-term impacts to surface water quality are those that would result from the continued erosion of areas that were not adequately reclaimed after a temporary use, from surface occupancy or use that extended beyond 5 years, or from ongoing point discharges (such as the surface release of produced water). Short-term impacts would include surface disturbances that temporarily affected water quality and were reclaimed immediately after a temporary use.

SURFACE WATER QUANTITY

Impacts to surface water quantity would result from management actions that altered streamflow, and could be either beneficial or adverse, depending on the quantity and the location of the withdrawals and discharges.

Direct impacts to surface water quantity would result from management actions (e.g., vegetative treatments or impoundments) that increased or decreased overland flow or streamflow, and from changes in the quantity of water discharged into the stream system.

Indirect impacts to surface water quantity would result from management actions that changed the amount of water reaching the stream system. The distribution and condition of riparian-wetland areas would indirectly result in changes to surface water quantity because they increase infiltration and delay peak flows. Where surface water and groundwater are interconnected, short-term direct impacts could occur where localized withdrawals caused a lowering of the water table. The intensity of impact would be a direct result of the rate of withdrawal.

Long-term impacts to surface water quantity would result from actions that altered the amount of impervious surface in a watershed or altered streamflows through long-term withdrawals and impoundments or ongoing point discharges. Short-term impacts would result from uses that temporarily affected water quantity, such as temporary impoundments.

GROUND WATER QUALITY AND QUANTITY

Direct impacts to groundwater quality and quantity would result from changes in the number of wells drilled in a given area, including domestic or municipal water supply wells, oil and gas wells, and water disposal or injection wells. These direct impacts could occur either through consumptive uses, localized lowering of the water table, and through direct contamination by materials used to drill and or complete wells. Contaminants could be introduced through improper well construction and/or maintenance. The number and location of new spring developments and the use of water conservation measures would directly impact groundwater quantity.

Indirect impacts to groundwater quality and quantity would result from management actions that modified recharge areas by decreasing vegetative cover, reducing infiltration of precipitation, or increasing overland flow.

Short-term impacts to groundwater could result from any temporary or short-term use of groundwater (e.g., temporary use of a well to supply water for exploratory drilling). Long-term impacts to groundwater quality and quantity could result from permanent oil and gas fields and production facilities being constructed in recharge areas or from landscape alterations that modified the areal extent of groundwater recharge zones. Such impacts could result from wells that depleted an aquifer through extraction of water, paved surfaces and compacted soils that decreased water infiltration, or the use of disposal wells to inject water into an underlying aquifer.

Management actions that increased permeability, such as reclaiming disturbed areas and removing redundant roads, would result in long-term beneficial impacts to groundwater quantity.

The primary management action that would impact groundwater quantity is minerals development. Oil and gas development and locatable minerals activity would use large volumes of water and would produce groundwater as a by-product of mineral activities. The amounts, locations, and quality of water produced would vary from site to site. Most produced water could generally not be reused for consumption without treatment. The impacts of these management actions cannot be identified on a planning area-wide basis and need to be analyzed in a site-specific NEPA document. Impacts to groundwater quantity from minerals activities under the alternatives are not further analyzed other than to state that as minerals development increases in intensity and extent, the potential for adverse impacts to groundwater quantity and quality, including potentially connected impacts to surface water quality and quantity increase. The BLM does not anticipate that there would be any impacts associated with water consumption or produced water except on a site-specific basis.

SUMMARY OF IMPACTS

Impacts to surface water and groundwater quality would relate to the amount of surface disturbance allowed under and alternative. Alternative B would result in the fewest adverse impacts to water resources. Management actions under this alternative would result in the smallest amount of surface disturbance and the most restrictions on resource use. As a result, the least amount of potential impacts to surface and groundwater quality and quantity would occur. Conversely, Alternative D would result in the most adverse impacts to water resources. Management actions under this alternative would result in the greatest amount of surface disturbance and the fewest restrictions on resource use. Alternative C manages water resources more like Alternative D than like alternative B. Alternative E manages water resources more like Alternative B than like Alternative C. Alternative A manages water resources more like Alternative E than like Alternative C.

All alternative would result in the same level of water consumption impacts associated with minerals-related activities. Impacts would be localized and addressed at the project level.

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in this impact analysis include the following:

Assumptions

- There would be 1 to 10 watershed enhancement projects (with an emphasis on MDEQ water quality impaired or threatened streams) constructed each year, disturbing a total of 1 to 100 acres per year.

- Surface water impoundments are human-constructed impoundments (e.g., pits, reservoirs, stock ponds) of surface water (e.g. overland flow, streamflow, springs) confined by a dam, dike, or other constructed barrier. This does not include impoundments of groundwater (unless the water were naturally discharged to the surface, as in a spring), water from wells, or produced water sources (e.g., water disposal pit).
- Waterbodies include all surface water (e.g., rivers, streams, creeks, coulees, springs, reservoirs, lakes, ponds, wetlands, and canals).
- Acre figures and other numbers used in the analysis are approximate projections for comparison and analytical purposes only. The planning area is estimated to contain approximately:

    - 300,000 acres of waterbodies, of which 9,500 are BLM-administered surface acres and 40,000 are BLM-administered mineral estate acres;
    - 1.0 million acres of floodplains of major rivers, of which 36,000 acres are BLM-administered surface and 82,000 acres are BLM-administered mineral estate under Alternative A; and
    - 1.4 million acres of floodplains, of which 43,000 are BLM-administered surface acres and 97,000 are BLM-administered mineral estate acres under Alternatives B, C, D, and E.

- Mitigation, specialized design features and CSU stipulations for oil and gas leasing and development would not correlate directly to a reduction of BLM-administered oil and gas wells or acres of surface disturbance.
- BLM-authorized activities would comply with state and federal regulations, Rangeland Health Standards, and BMPs to protect the chemical, physical, and biological integrity of the water and riparian habitat. These methods of minimizing adverse impacts to water quality reduce impacts to soil and vegetation, which in turn protects water resources by reducing surface runoff and sediment yield.
- Improving the condition of degraded uplands, riparian areas, and wetlands is a reasonable land, soil, and water conservation practice that reduces nonpoint source pollution from these source areas (Aron et al. 2013). Actions that increased the resiliency of ecosystems would reduce the vulnerability of the water resources to climate change impacts. A resilient ecosystem would be able to function properly during slow and moderate climate changes (CEICC 2008).
- Management actions that disturb soils are the most likely to create dust or deliver sediment to waterbodies and adversely impact surface water. Erosion contributes to sedimentation if the sediment is delivered to the waterbody either as fugitive dust or carried by surface water. The amount carried by surface water is limited by the effectiveness of storm water discharge practices and the buffering capacity of the land over which the water flows before reaching the waterbody. Management actions that protect soil and vegetation resources will generally mitigate or prevent adverse impacts to water resources as well.
- The extent of unsurfaced roads and the degree of usage is an indicator of the quantity of sediment delivery that could impact surface water quality within each watershed. The alternatives vary substantially in the number and types of ROWs likely to be authorized and the amount of traffic likely to be generated by authorized activities. Therefore, to the extent that an alternative limits resource uses, such as closing an area to oil and gas development or reducing areas open to motorized travel, it would involve fewer unsurfaced roads and avoid traffic from oil and gas operations over unsurfaced roads. Therefore, reduced resource use is an indicator of beneficial impacts to water quality.
- All alternative employ various methods to minimize adverse impacts to water quality. BMPs, riparian and habitat enhancement projects, mitigation measures and specialized design features, conservation practices, and project-specific reclamation plans are designed to reduce impacts to soil and vegetation, which maintains water resources by reducing overland flow and sediment yield. Limiting motorized vehicles to existing roads and trails would prevent route proliferation and vegetation removal, which could decrease erosion. Restoring plant communities would enhance water resources by improving infiltration, organic matter content, and productivity, and by reducing erosion and sediment generation.
- Soil disturbance, including compaction or changes in vegetative cover, increases overland flow and downstream sediment loads, which reduces water quality, channel structure, and watershed health. The magnitude of impacts attributed to one or more disturbances is determined in part by the specific activity, season, proximity to waterbodies, location in the watershed, condition of upland and riparian

vegetation, soils, watershed resilience, efficacy of mitigation, and the time elapsed until reclamation success. Only a site-specific analysis can address these potential impacts to water resources.

- Changes in channel geometry from surface-disturbing activities would be likely to have adverse impacts on water quality. The maintenance of channel geomorphology and riparian-wetland areas is dependent on sediment supply to the system. Stream channels generally achieve a channel form in equilibrium to the amounts of water and sediment that are naturally supplied to them. Changes in sediment load or streamflow often lead to changes in channel form.
- The acreage of WSAs is the same under all alternatives, and all alternatives prohibit surface-disturbing activities in those areas.
- The use of hydraulic fracturing for well stimulation occurs in the planning area for oil and gas development. It is estimated that the typical Bakken or Three Forks Formation well requires between 2 and 4 million gallons (6.1 to 12.3 acre-feet) of freshwater for hydraulic fracturing operations (EPA 2012).

Methods

- The GIS estimation of waterbody acres is based on the 1:24,000-scale 2009 USGS National Hydrography Dataset flowlines (with an approximation of 12-foot wide perennial streams and 4-foot wide intermittent and ephemeral streams) in combination with waterbody and major stream polygons. The GIS estimation of floodplain acres are based on NRCS soil interpretation of a flood frequency classification of a rare to very frequent flooding class (a 1 percent or greater chance of flooding in any given year). The NRCS data are based on soil properties, evidence collected during soil survey fieldwork, and flood analyses, where available. Federal Emergency Management Agency data (of very limited extent in the planning area) were incorporated for classification of floodplains with very frequent flooding. Because it is based on known acres, the estimate is low. Data would be incorporated as they were collected.
- Under Alternative A, floodplains of major streams were delineated based on floodplains within 250 feet of named streams.
- Impacts analysis and conclusions are based on interdisciplinary team knowledge of resources, reviews of existing literature, and information provided by other agencies and institutions.
- Acre figures in all tables, except where noted, may overlap, and adding these figures will not result in accurate total acreage values.
- Estimates for the volume of freshwater needed to hydraulically fracture oil wells on BLM-administered mineral estate were calculated using the following method: The spatial extent of the Bakken and Three Forks geologic formations was acquired from USGS data (USGS 2013). An RFD projection was made for oil resources on BLM-administered mineral estate within this area of interest under each of the alternatives. The method used to determine the number of new wells projected to be drilled during the life of the plan has been discussed in detail in the BLM RFD technical review document (BLM 2013). The number of new wells projected under each alternative was then multiplied by the estimated freshwater consumption requirements discussed in the *Assumptions* section above to yield a potential range of freshwater volumes.

IMPACTS COMMON TO ALL ALTERNATIVES

Impacts to Surface Water Quality

When watersheds lack adequate vegetative cover, surface infiltration into the soil decreases, which causes more overland flow to reach waterbodies. As surface disturbance increases, so does the amount of bare soil, compacted soils, and impervious area in a watershed. More overland flow reaches streams in a shorter period, which increases the potential for sedimentation and the frequency of flooding or erosive velocities from high flows in channels. Conversely, activities such as reclamation or vegetation treatments would improve vegetative cover and would beneficially impact water resources (Hansen et al. 1995). Healthy vegetative cover increases infiltration of surface water flows, filters out sediment before it reaches drainages, reduces overland flow, and lowers peak stream flows. Concentrated grazing by livestock and wildlife can contribute to soil compaction and damage the vegetative cover and soil crust, increasing overland flow, erosion, and sedimentation.

All alternatives include actions that restrict surface disturbance, which is generally considered to beneficially impact water resources. For example, withdrawals that close areas to surface-disturbing activities or requirements for construction, operation, monitoring, and rehabilitation planning before surface-disturbing activities are initiated would, at a minimum, reduce the potential for adverse impacts to water resources from surface-disturbing activities. Conversely, restricting surface-disturbing activities could preclude the long-term benefits that would otherwise be gained through activities that directly benefited resources, such as watershed enhancement projects, aquatic and terrestrial wildlife habitat projects, and riparian-wetland enhancement projects. Table 4-20 shows how management actions related to oil and gas leasing and development would affect acres of water resources maintained (i.e., closed or NSO stipulation), conserved (i.e., CSU stipulation), or at risk of degradation (i.e., open with no restrictions).

TABLE 4-20.
WATER RESOURCES MAINTAINED, CONSERVED, AND AT RISK OF DEGRADATION FROM OIL AND GAS ASSOCIATED SURFACE DISTURBANCES

	Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Resources Maintained	Floodplains	82,000 acres	97,000 acres	800 acres	800 acres	97,000 acres
	Waterbodies	40,000 acres	40,000 acres	700 acres	700 acres	40,000 acres
Resources Conserved	Floodplains	0 acres	0 acres	96,000 acres	96,000 acres	0 acres
	Waterbodies	0 acres	0 acres	39,000 acres	39,000 acres	0 acres
Resources at Risk	Floodplains	14,000 acres	0 acres	0 acres	0 acres	0 acres
	Waterbodies	0 acres	0 acres	0 acres	0 acres	0 acres

Surface-disturbing activities on floodplains and waterbodies would result in erosion, overland flow, sediment delivery to waterbodies, and degraded channel morphology (MDEQ 2012b). The capability of floodplains to dissipate energy associated with high water events would be reduced and infiltration rates, water storage, and aquifer recharge would be altered. Watershed resilience would be reduced, which would prolong the current and future periods until reclamation success. The presence of aboveground facilities would create flood hazards. Any construction activity in flowing waterbodies would be likely to exceed Montana's water quality criteria for turbidity and require a variance.

Surface-disturbing activities in riparian-wetland areas would cause soil compaction, vegetation removal, and soil disturbance, which would increase overland flow, sedimentation, and instability of the stream channel and streambanks. The ability of riparian vegetation to dissipate the energy of high water flows, filter sediment, stabilize streambanks, and enhance floodplain functionality would be reduced. The capacity of wetlands to improve water quality, allow groundwater recharge and discharge, filter sediment, retain floodwater, and remove pollutants from water would be reduced (Prichard et al. 1999). Draining of wetlands could increase the magnitude of large flooding events (Poff et al. 1997). Although many of these impacts would be short-term with successful reclamation, success of reclamation activities would probably be low and impacts would be likely to persist (FERC 2004). Changes to surface and subsurface drainage would result in permanent changes in wetland integrity and function if water retention were reduced or eliminated through the disturbance of impermeable layers. Spills from equipment or facilities could contaminate shallow groundwater and surface water in riparian-wetland areas.

Invasive species that form monoculture stands can exacerbate erosion by reducing vegetative cover, with resulting adverse impacts to water resources. The presence of invasive species can alter natural fire regimes and increase fire frequency, which would lead to accelerated soil erosion and result in sediment deposition to waterbodies (BLM 2007d).

No long-term surface disturbance or associated erosion is anticipated from prescribed fire, chemical treatments, or mechanical fuels treatments following reclamation. Fuels management including prescribed fire could result in short-term adverse impacts such as increased sedimentation but would result in long-term beneficial impacts

to water quality (BLM 2007d) by increasing vegetative cover and decreasing the potential for large landscape-level fires.

Wildland fire in the planning area could impact water quality over the short-term by removing vegetation and exposing soils to water and wind erosion, thereby generating sediment. Under certain conditions, hot fires can create hydrophobic soil conditions, whereby overland flow and erosion increase. Over the long-term, if vegetative recovery is successful, fire could beneficially impact water quality by improving land health, reducing erosion and sediment delivery, and lowering the risk of landscape-level fire. The extent of using wildland fire to restore fire-adapted ecosystems or reduce hazardous fuels varies by alternative. On a planning-level scale, it is not possible to analyze impacts to water resources under individual alternatives because of the unpredictable nature of wildfire, which depends on fire size and severity, soils, watershed slope, vegetation, location in the watershed, and extent of watershed burned, and the contributions of weather, disease, and climate change.

Fire suppression and rehabilitation activities can impact water resources over the short and long-terms. Activities such as firebreak construction, clearing vegetation, and the use of heavy equipment would disturb the soil surface and increase erosion and sediment production over the short-term. For example, fire lines constructed during suppression efforts can concentrate overland flow, which can result in gully erosion. Fire retardant could enter waterbodies directly or via surface runoff, which would impair water quality (Little and Calfee 2004). Over the long-term, however, successful stabilization efforts can increase cover and result in a subsequent reduction in erosion and sediment production to natural rates. Fire suppression that resulted in fuel buildup would reduce watershed function and water quality in the short and long-term by reducing infiltration, reducing vegetation cover, and increasing erosion (Elliot, Miller, and Audin 2010).

Management of forest product sales would result in vegetation removal, surface disturbance, road construction, and soil compaction, which would increase erosion, surface runoff, and sedimentation. Streamside vegetation removal would increase water temperatures and reduce the ability of vegetative buffers to reduce nonpoint source pollution. Post-fire salvage logging would delay natural watershed recovery, particularly in areas of high-severity fires, riparian areas, steep slopes, and erosion-prone soils (Karr et al. 2004). BMPs to reduce adverse impacts to surface water (such as *Water Quality BMPs for Montana Forests* [Logan 2001]) and compliance with the Streamside Management Zone Law would reduce impacts to water quality under all alternatives.

Properly managed livestock grazing at appropriate stocking levels can have a neutral to beneficial impact on vegetation and soil resources, and therefore water resources (Mosley, Cook, Griffis, and O'Laughlin 1999; Saunders and Fausch 2007). Grazing impacts are measurable only on a site-specific basis and would vary based on utilization, location in the watershed, duration, and season of use. Improved livestock management would reduce or reverse the impacts of improperly managed livestock grazing, which would result in declines in erosion within 5 to 14 years and increased vegetation cover, riparian and wetland functionality, and recruitment of desired riparian woody species; however, some channel and bank morphological properties would take longer to adjust (14 or more years) (Magilligan and McDowell 1997). Grazing plans and systems and range improvements that reduced utilization in waterbodies and riparian areas would mitigate the impacts of grazing by mitigating changes to riparian vegetation, channel morphology, and inputs of sediment, salinity, bacteria, and nutrients (Sada et al. 2001). Livestock grazing use adjustments due to drought, fire, flood, and insect infestations would decrease the compounded impacts of livestock grazing during watershed disturbance. The alternatives vary in how rangeland health standards and PFC will be achieved through managing livestock grazing.

Coal Unsuitability Criterion 16 designates 100-year floodplains as unsuitable for coal leasing according to risks of substantial threat of loss of life or property. As applied in the Powder River RMP, water resources on 3,215 acres along the Tongue River and 2,966 acres along the Powder River would be maintained. Floodplains of "lesser streams" would be affected by mining. Potential alluvial valley floors along 856 stream miles would be listed as unsuitable at the planning stage, which would maintain water resources (BLM 1985c). Monitoring by lessees in accordance with federal and state requirements would assure compliance and protect the quality and quantity of surface water and groundwater. Reclamation would reconstruct drainages with the approximate

original contour and lower surface elevation, which would cause permanent changes in stream channels (BLM 1984).

Treated and untreated discharged produced water from CBNG development could degrade water quality. The water produced by CBNG wells is typically saline and sodic. Surface water flow would moderately increase through the discharge of produced water, which would alter the natural hydrologic regimes (such as changes in the magnitude and timing of low and peak flows) and cause erosion, headcutting, and increased sedimentation (BLM 2008g). Produced water spilled or treated in infiltration impoundments would impact shallow groundwater aquifers and potentially reach and contaminate surface water through groundwater interface (Steinhorst et al. 2010). The infiltration of produced water could dissolve and mobilize sulfate, selenium, arsenic, manganese, barium, chloride, nitrate, and TDS from soils to water (NAS 2010). Proper siting and design of impoundments would mitigate these impacts. Although surface water quality in some watersheds would be altered in combination with new and existing permits, beneficial uses would not be diminished. For a detailed analysis of CBNG impacts, refer to the BLM's 2008 *FSEIS*.

The magnitude and duration of the impacts of linear underground facilities crossing waterbodies would vary and depend on the method used. Open-cut wet crossings of flowing water would result in direct contact with water during all stages of construction and potential in-stream storage of spoil, and these actions would increase sedimentation; destabilize streambanks; decrease streambed porosity; alter channel morphology; and cause short-term increases in total suspended solids (TSS), TDS, nutrients, metals, and total organic carbon (Lévesque and Dubé 2007). Excavation of streambeds composed primarily of clay or silt sized particles would cause persistent increases in suspended sediment concentration (SSC) or turbidity that would limit the ability of sediment control structures to reduce downstream sediment concentrations (Reid, Ade, and Metikosh 2004, p. 6). Generally, if bank stabilization occurred, sediment entrainment would occur during construction (typically within 24 to 48 hours but potentially up to a few weeks) and the impacts of open-cut wet crossings to streambed conditions would not be evident within 1 to 4 years (Reid et al. 2004). Isolated crossing methods would have, on average, peak TSS 3 to 20 times lower than open-cut wet methods (Reid et al. 2004) and more effectively mitigate sediment loading (Lévesque and Dubé 2007). Isolated methods would cause impacts with reduced severity and duration because the increases in turbidity and sedimentation would be limited to installation and removal of dam or flume structures (Lévesque and Dubé 2007). Bore crossing or horizontal directional drilling would avoid contact with water resources. The impacts of linear underground facilities to water resources would be reduced through mitigation measures required by federal or state permits or authorizations.

OHV impacts would be localized in intensively used areas. Vehicle fords would cause localized erosion, sedimentation, and degradation of streambanks. Weed invasion would lead to accelerated erosion and changes in watershed hydrology. Sheet or rill erosion would be the most common on poorly designed or maintained roads and trails during periods of high moisture; these impacts would increase with increasing OHV use. Impacts would be reduced and localized in areas in which OHVs would be limited to designation routes. In general, these impacts are estimated to occur in less than 1 percent of a watershed (BLM and USFS 2001).

Surface-disturbing activities associated with ROWs would expose soils to increased erosion and increased rates and volumes of surface runoff over the short and long-terms. Increases in surface disturbance related to lands actions can be expected to result in a proportionate increase in adverse impacts to water resources.

Impacts to Surface Water Quantity

Management actions that reduced contributions to climate change and accommodated or mitigated long-term changes in seasonal weather patterns would benefit water resources by contributing to stability in surface water quantities.

Construction of new surface water impoundments would result in long-term adverse impacts such as reduced streamflow, dissolved oxygen concentrations, and floodplain size and extent downstream (Vörösmarty and Sahagian 2000); increased scour of the downstream streambed and water temperatures (Dodds et al. 2004); increased evaporative losses; altered timing and magnitude of peak and low flows, sediment loading, and

riparian vegetation recruitment and succession. Expanded water use, withdrawals, and storage would exacerbate the impacts of climate change on water resources (IPCC 2007). The decommissioning of surface water impoundments would reduce these impacts within the watershed.

Fuels management including prescribed fire could result in short-term adverse impacts such as increased overland flow but would result in long-term beneficial impacts to water quantity by increasing vegetative cover, altering vegetative structure and composition (BLM 2007d), and decreasing the potential for large landscape-level fires. Reducing hazardous fuel loads would reduce the vulnerability of water resources to climate change impacts (CEICC 2008).

Management of forest product sales would primarily result in impacts to soil resources, and secondarily to water resources. Cutting of forest products could result in short-term and potentially long-term adverse impacts to water resources by removing vegetation and increasing erosion and surface disturbance.

Coal mining activities would disrupt surface water by reducing streamflow downstream and reducing peak flows during mining activities. Sedimentation would be reduced by sedimentation ponds. Spoils would experience decreased infiltration following reclamation (for 10 to 15 years) and, as a result, overland flow and peak flows would increase by approximately 5 percent (BLM 1984). Discharge of produced water during operations and discharge of groundwater with leached salts following operations would impact surface water quality and quantity.

Oil and Gas drilling operations would impact available quantities of surface water and groundwater. The possible sources of water are varied and include water marketed by municipalities; permits for new appropriations of surface water and changes to existing water rights; groundwater appropriations; and recycled water. Water withdrawals would lead to reduced aquifer water levels, reduced streamflow (through direct withdrawals or drawdown of aquifers that are hydraulically connected to nearby streams or springs), and impacts to water quality parameters associated with stream flow. Impacts associated with flow depletion could include increased water temperature, decreased concentration of dissolved oxygen, and increases in other parameters such as salinity and sodium adsorption ratio. Typically, produced water from conventional oil and gas wells would originate from a depth below useable aquifers or coal seams. Compliance with state regulations would mitigate the impacts of water withdrawals on waterbodies and aquifers by ensuring that water rights are established for all beneficial uses of water, ensuring that water resources are not over-appropriated, and considering the impacts of water withdrawals to groundwater wells and hydraulically connected surface waters.

Impacts to Groundwater Quality and Quantity

Fuels management including prescribed fire could result in short-term adverse impacts such as decreased groundwater recharge but would result in long-term beneficial impacts to groundwater quality and quantity (BLM 2007d). Reducing hazardous fuel loads would reduce the vulnerability of groundwater resources to climate change impacts (CEICC 2008).

Groundwater contamination can come from point sources, such as chemical spills, chemical storage tanks, oil and gas well sites, oil and gas detention and retention ponds, and mining activities. Impacts from in situ leach uranium recovery would be small to moderate (USNRC and WDEQ 2009). Impacts would include the potential for contamination of aquifers by radionuclides or other constituents (e.g., selenium, metals, salinity, high or low pH) through equipment failures, aquifer heterogeneity, fractures, or improper well completions (Meredith 2010). Other possible sources of groundwater contamination are nonpoint sources such as roadways and agricultural activities. Groundwater quality is most susceptible to pollution where the aquifer is shallow, very permeable, or connected directly to a surface water system, such as river gravels.

Coal seams typically serve as groundwater aquifers. Drawdown from mining operations would be up to 75 feet and extend up to 5 miles from the site (BLM 2008g), which would take years to recover. Impounding or discharging produced water would increase evaporative losses of groundwater. Seepage from holding ponds would impact groundwater. As coal and overburden were removed, local groundwater quality and quantity would be affected permanently by replacement with a spoil aquifer (BLM 1984). After mining, for hundreds to

thousands of years, groundwater discharged from the site would contain increased leached salts (increases of 500 to 2,000 milligrams per liter total dissolved solids [TDS]). The degree of this increase would depend on the geology and the extent would be several miles downgradient (BLM 1984). Agricultural beneficial uses would not be supported in isolated areas in which groundwater was a major contributor to surface water (BLM 1984). Water quality and discharge impacts would be mitigated by compliance with state regulations.

Potential impacts on groundwater resources from fluid mineral extraction activities could include the following scenarios:

- Contamination of aquifers during drilling through the introduction of drilling fluids.
- Extended fracture growth allowing fracking fluid migration into source water zones or drinking water supplies (USEPA 2004).
- Cross-contamination of aquifers from the introduction of drilling fluids into one aquifer that travels upward into shallower units due to improperly sealed well casings.
- Localized depletion of unconfined groundwater availability.
- Progressive contamination of deep confined, shallow confined, and unconfined aquifers if the deep confined aquifers are not completely cased off from deeper units.
- Contamination of shallow aquifers by improperly managed or closed reserve pits.

Evaporation would concentrate water-soluble metals, salts, and other chemicals in reserve pits. Precipitation, fluctuation of shallow groundwater, and flooding could mobilize these contaminants into groundwater. Solidification would prevent mobilization of potential contaminants. Removal and off-site disposal of liquids would remove most of the water-soluble metals, salts, and chemicals from the drilling waste material. The use of pitless or closed-loop technology could conserve water, recycle drilling fluids, reduce surface disturbance, and eliminate the use of pits. In unlined pits that were buried onsite or in pits with torn liners, drill cuttings could contribute contaminants to groundwater (Ramirez, Jr. 2009).

Produced water from conventional oil and gas, uranium recovery, and CBNG development would impact the quality of surface water and groundwater through impoundments, injection, and discharge. Impounding or discharging produced water would increase evaporative losses of groundwater. Left untreated, produced water discharge and infiltration or leaking produced water disposal pits could reach stream channels via subsurface flow, which would decrease water quality. Proper siting and design of disposal pits would mitigate these impacts. Underground injection control regulations would isolate injection zones from potentially useable aquifers, which would limit the impacts.

Drawdown in coal seams after 20 years of CBNG development is expected to be 20 feet within 5 miles of development, which would impact groundwater wells completed in these developed coal seams. These wells would have reduced yields but would not be expected to become dry because the aquifer would remain saturated. Within 3 to 4 years of the end of development, recovery would be expected be to within 20 to 30 feet of pre-development conditions, with complete recovery within hundreds of years (BLM 2008g). “Little evidence exists to substantiate that surface water has been depleted by pumping water during CBM [CBNG] production at the large watershed scale” in the PRB (NAS 2010, p. 185).

The application of BMPs and compliance with State and federal rules and regulations would be adequate to minimize adverse impacts from these activities. The production of water from oil and gas wells would have the greatest potential to impact groundwater quality and quantity where the wells are producing from zones containing aquifers which are used as a source of freshwater.

ALTERNATIVE A (No Action)

Summary Statement

Water resources management under Alternative A provides the fewest restrictions on surface-disturbing activities and would result in the highest level of impacts to water resources. However, all management actions under Alternative A would meet Montana State Water Quality Standards and support the beneficial uses of

waterbodies. In situations where water quality or beneficial uses were threatened, the BLM would take corrective action as required by existing regulations. Surface-disturbing activities on 75,000 acres of BLM-administered surface and mineral estate over the planning period (See *Disturbance Appendix*) would result in indirect impacts to water quality through erosion, surface runoff, and excess sediment delivery to waterbodies. Alternative A would allow surface-disturbing activities and oil and gas development with an NSO stipulation in 100-year floodplains of major rivers and on waterbodies, provided that the activity would meet the requirements of Executive Order 11988 and federal and state water quality requirements. These NSO stipulations along with non-discretionary closures would maintain 82,000 acres of 100-year floodplains and 40,000 acres of waterbodies (Table 4-20). The projected number of wells and associated surface disturbance under Alternative A would result in an estimated disturbance over the planning period of 9 acres of disturbance on 100-year floodplains and 14 acres on waterbodies (Table 4-21). However, Alternative A would allow oil and gas development on 14,000 acres of floodplains of non-major rivers without a stipulation, which would have an adverse impact on water quality.

Alternative A would allow surface-disturbing activities in 3,400 acres of State-designated Source Water Protection Areas (SWPA) and would allow oil and gas development in these areas with lease terms. Impacts to water quality in SWPAs from these activities would be similar in nature to those described for the specific activity but of a greater severity due to their proximity to waterbodies or aquifers that provide source water for public water supplies. Source water contamination could impact human health through the introduction of bacteria, salts, metals, volatile chemicals, or other contaminants into public water supplies. Oil and gas development under Alternative A would be anticipated to result in 3 acres of surface disturbance in SWPAs (Table 4-21).

TABLE 4-21.
PROJECTED BLM-ADMINISTERED ACRES OF WATER RESOURCES DISTURBED DURING THE PLANNING PERIOD BY OIL- AND GAS-ASSOCIATED ACTIVITIES

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Floodplains	9 acres	16 acres	61 acres	61 acres	37 acres
Waterbodies	14 acres	6 acres	24 acres	24 acres	14 acres
SWPAs	3 acres	1 acre	3 acres	3 acres	2 acres

Resources

Although prohibiting surface-disturbing activities due to a variety of resource concerns would prevent short-term adverse impacts to water resources, it would also prevent some long-term beneficial impacts. Management actions under Alternative A that prohibited surface-disturbing activities would prevent the completion of 87 acres of riparian-wetland enhancement projects, 87 acres of watershed enhancement projects, 1,700 acres of mechanical treatments for vegetation, 87 acres of aquatic habitat enhancement projects, and 87 acres of wildlife habitat enhancement projects (See *Disturbance Appendix*). Preventing the completion of these resource projects would prevent short-term adverse impacts such as accelerated erosion, surface runoff, and sedimentation. However, it would also preclude the long-term benefits of such projects (e.g., improved fish passage; improved composition, density, and structure of vegetative communities; increased watershed health and function; etc.).

Alternative A would help conserve water resources because it would require a CSU stipulation for oil and gas development on steep slopes and would limit or avoid other surface-disturbing activities on steep slopes and highly erodible soils. The provisions of the Montana Storm Water Discharge Permit Program would help avoid adverse impacts to water resources from accelerated erosion and sediment loading.

Alternative A would allow surface-disturbing activities and oil and gas development in riparian-wetland areas provided that the activity would meet the requirements of Executive Order 11990, CWA wetland protections, and federal and state water quality requirements or with an NSO stipulation, which would maintain water quality. This NSO stipulation would maintain 150,000 acres of riparian areas adjacent to waterbodies. However, maintaining adequate vegetated buffers adjacent to riparian-wetland areas would not be required, which would increase the risk of adverse impacts to water resources. Vegetated buffers reduce nonpoint source pollution

from upland areas and improve water quality, allow groundwater recharge, filter sediment, retain floodwater, and remove pollutants (Ellis 2008; Pritchard et al. 1999).

Alternative A would allow surface-disturbing activities in areas of invasive species infestations, which would be likely to spread invasive species. Impacts to water quality and quantity based on invasive species infestations are addressed above under *Impacts Common to All Alternatives*. The result would be adverse long-term impacts to water quality.

Alternative A would allow oil and gas development with an NSO stipulation within 0.25 miles of wetlands identified as piping plover or interior least tern habitat, which would maintain water resources. Additionally, Alternative A management actions that prohibited surface-disturbing activities in order to prevent impacts to other wildlife and special status species habitat would help prevent the adverse impacts associated with these activities to water resources.

Resource Uses

Under Alternative A, approximately 710 surface water impoundments would be constructed, disturbing 710 acres (See *Disturbance Appendix*). Impacts to water resources based on construction of new surface water impoundments are addressed above under *Impacts Common to All Alternatives*.

Under Alternative A, livestock grazing and associated surface-disturbing activities would be allowed with minimal restrictions. Two spring developments would be constructed per year and would be fenced to reduce the impacts of livestock concentration. Alternative A would avoid the placement of livestock water developments in riparian-wetland areas within the area administered under the Big Dry RMP, which would reduce vegetation removal, soil compaction, and sediment production from concentrated livestock grazing. However, it would allow livestock water developments in riparian-wetland areas within the area administered under the Powder River RMP, which would have an adverse impact on water quality. Suspending or canceling livestock grazing in areas affected by coal development would maintain water quality, but allowing livestock grazing during or immediately after locatable mining or oil and gas development, and immediately after coal mining would accelerate impacts from multiple land use activities and have an adverse impact on water quality. Deferring livestock grazing for 1 growing season following fire activities would have a beneficial impact to water resources. However, timing, use, and grazing duration of burned rangelands may be more important than a specific period of rest (Bates, Rhodes, Davies, and Sharp 2009); therefore, until vegetation recovered, livestock grazing would inhibit restoration of watershed function (Beschta et al. 2004), and the cumulative impacts would have an adverse impact on water resources.

Alternative A would allow wood product sales for posts and poles, Christmas trees, and firewood, and sales for salvage harvest of ponderosa pine affected by insects, fire, or other natural causes. Alternative A would manage forestlands with 10% of more canopy cover per acre for the enhancement of resources, which would have a beneficial impact on water resources. Salvage harvest activities would result in 1,400 acres of surface disturbance (See *Disturbance Appendix*), which would have an indirect adverse impact on water resources. Impacts to water resources based on management of forest product sales are addressed above under *Impacts Common to All Alternatives*.

Under Alternative A, surface disturbance from minerals development could impact 17,000 acres of BLM-administered mineral estate (See *Disturbance Appendix*). There would be a commensurate potential to adversely impact water quality and quantity to the extent that produced water was generated by minerals development. Oil and gas development would be allowed with an NSO stipulation, which would maintain water resources. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on BLM-administered mineral estate would use an estimated 260 to 520 acre-feet of freshwater. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents only 5-11 percent of a single day's surface and groundwater withdrawals for irrigation use within the planning area. Impacts from water withdrawals for hydraulic fracturing would be short-term and minor. See *Water Resources – Management Common to All* and the *Minerals Appendix – Completion Operations* for information on potential sources of water.

Areas of concentrated open off-highway vehicle use (2,400 BLM-administered acres) would result in erosion, sedimentation, and soil compaction, which would have an adverse impact on water quality. The functionality of 120 acres of floodplains and 30 acres of waterbodies within the open off-highway vehicle areas would be impacted. See *Impacts Common to All Alternatives* above for impacts of surface-disturbing activities specific to floodplains and waterbodies.

ROWs result in surface disturbance, with the potential for adverse impacts to water quality. Alternative A allows ROWs on more acres than under any other alternative. As a result, Alternative A has the potential to result in the most adverse impacts from ROWs to water resources.

ALTERNATIVE B

Summary Statement

Water resource management under Alternative B would result in more beneficial impacts to water resources than under Alternative A. Management actions under Alternative B would reduce threats to water quality compared to Alternative A, meet Montana State Water Quality Standards, and support the beneficial uses of waterbodies. In situations where water quality or beneficial uses were threatened, the BLM would take corrective action as required by existing regulations. Surface-disturbing activities would be allowed on less than half as many BLM-administered surface and mineral estate acres (36,000 acres) as under Alternative A (See *Disturbance Appendix*). Alternative B would prohibit surface-disturbing activities that did not benefit the functionality of floodplains and waterbodies and would allow oil and gas development with an NSO stipulation in these areas. These stipulations along with discretionary and non-discretionary closures would maintain 97,000 acres of 100-year floodplains and 40,000 acres of waterbodies (Table 4-20). The projected number of wells and associated surface disturbance under Alternative B would result in an estimated disturbance over the planning period of 16 acres of disturbance on 100-year floodplains and 6 acres of disturbance on waterbodies (Table 4-21). Water resources management actions under Alternative B would result in moderately more beneficial impacts to water resources than under Alternative A.

Alternative B would limit more surface disturbance than Alternative A within State-designated SWPAs by prohibiting surface-disturbing activities and requiring an NSO stipulation for oil and gas development. These restrictions would prevent contamination of waterbodies and aquifers within SWPAs by surface-disturbing activities on BLM-administered surface and mineral estate. Oil and gas development under Alternative B would be anticipated to result in 1 acre of surface disturbance in SWPAs (Table 4-21). Alternative B provides substantially greater protection to SWPAs than Alternative A.

Resources

Management actions under Alternative B that prohibited surface-disturbing activities would prevent the completion of 1,300 acres of riparian-wetland enhancement projects, 1,300 acres of watershed enhancement projects, 25,000 acres of mechanical treatments for vegetation, 1,300 acres of aquatic habitat enhancement projects, and 1,300 acres of wildlife habitat enhancement projects (See *Disturbance Appendix*). Alternative B would substantially reduce the number of resource improvement projects benefiting water resources in the long-term.

Alternative B would prevent or mitigate soil erosion from surface-disturbing activities and would help maintain water resources by reducing or eliminating sediment production and delivery. Alternative B would prohibit surface-disturbing activities on sensitive soils, badlands, and rock outcrop and would require an NSO stipulation for oil and gas development in these areas. Soils management actions under Alternative B would result in moderately more beneficial impacts to water resources than under Alternative A.

Alternative B would prohibit surface-disturbing activities and oil and gas development in riparian-wetland areas, which would maintain water resources. Closures would maintain 150,000 acres of riparian areas adjacent to waterbodies. In addition, Alternative B would establish a 300-foot buffer on riparian-wetland areas. Surface-disturbing activities within this buffer would be allowed with mitigation measures to maintain or improve the functionality and resiliency of the associated riparian-wetland area, and oil and gas development would be

offered with a CSU stipulation, which would conserve riparian-wetland areas. This CSU stipulation would conserve an additional 1,200,000 acres adjacent to riparian-wetland areas, which would maintain a vegetated buffer adjacent to waterbodies, reduce nonpoint source pollution, and maintain water quality. Riparian-wetlands management actions under Alternative B would result in moderately more beneficial impacts to water resources than under Alternative A.

Alternative B would prohibit surface-disturbing activities in areas of invasive species infestations. Alternative B would better limit the introduction and spread of invasive species and be more likely to prevent their adverse impacts.

Management actions under Alternative B designed to maintain wildlife and special status species habitat limit substantially more surface disturbance than Alternative A near piping plover, interior least tern, and pallid sturgeon habitat, which would maintain water resources. Additionally, surface-disturbing activities are prohibited within Bighorn sheep habitat, crucial big game winter range, and black-tailed prairie dog habitat, which reduces surface disturbance substantially compared to Alternative A. Less surface disturbance would mean fewer adverse impacts to water resources.

Resource Uses

Alternative B would prohibit new surface water impoundments, which would eliminate the potential for adverse impacts to water resources.

Alternative B forest management would provide more moderate restrictions on forest product sales than Alternative A and would beneficially impact water resources. Alternative B would allow sales for salvage harvest of ponderosa pine affected by insects but not for any other forest products. Alternative B would reduce surface disturbance due to salvage harvest activities to 280 acres (See *Disturbance Appendix*). The reduction in surface disturbance under Alternative B would likely result in fewer adverse impacts to water resources than under Alternative A.

Alternative B livestock grazing management would provide for more protection of water resources than Alternative A and would beneficially impact water resources. New spring developments in riparian-wetland areas would be prohibited under Alternative B. Alternative B would also prohibit the placement of livestock water developments in riparian-wetland areas, which would reduce vegetation removal, soil compaction, and sediment production from concentrated livestock grazing. Alternative B would exclude livestock grazing during locatable mining and suspend AUMs based on acres of oil- and gas-associated surface disturbance, which would facilitate reclamation and maintain water resources. Allowing livestock grazing immediately after reclamation of locatable mining, oil and gas development, or coal mining would accelerate impacts from multiple land use activities and have an adverse impact on water quality. Alternative B would defer livestock grazing for 2 growing seasons following fire activities, which would have a beneficial impact to water resources. However, timing, use, and grazing duration of burned rangelands may be more important than a specific period of rest (Bates, Rhodes, Davies, and Sharp 2009); therefore, until vegetation recovered, livestock grazing would inhibit restoration of watershed function (Beschta et al. 2004), and the cumulative impacts would have an adverse impact on water resources.

Under Alternative B, surface disturbance from minerals development could impact 15,000 acres of BLM-administered mineral estate (See *Disturbance Appendix*). Alternative B would decrease the amount of surface disturbance related to minerals development substantially compared to Alternative A. The severity of surface disturbance from oil and gas development under Alternative B would be similar to that under Alternative A because both alternatives allow oil and gas development with an NSO stipulation, which would maintain water resources. Therefore, Alternative B would result in a substantial decrease in risk of adverse impacts to water quality. For a comparison of water resources maintained, conserved, and at risk from oil and gas development among the alternatives, see Table 4-20. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on BLM-administered mineral estate would use an estimated 190 to 380 acre-feet of freshwater. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents only 4-8 percent of a single day’s surface and groundwater withdrawals for irrigation use within the planning area. Impacts from water

withdrawals for hydraulic fracturing would be short-term and minor. See *Water Resources – Management Common to All* and the *Minerals Appendix – Completion Operations* for information on potential sources of water.
Not authorizing areas of concentrated open off-highway vehicle use would limit erosion, sedimentation, and soil compaction, which would maintain water quality.

Alternative B would open substantially less acreage for ROWs than Alternative A and manage more area as ROW avoidance and exclusion areas. The reduction in surface disturbance under Alternative B would likely result in fewer adverse impacts to water resources than under Alternative A.

ALTERNATIVE C

Summary Statement

Alternative C manages water resources with moderate restrictions on surface-disturbing activities, which would have a beneficial impact on water resources. Management actions under Alternative C would reduce threats to water quality compared to Alternative A, meet Montana State Water Quality Standards, and support the beneficial uses of waterbodies. In situations where water quality or beneficial uses were threatened, the BLM would take corrective action as required by existing regulations. Surface-disturbing activities would be allowed on BLM-administered surface and mineral estate acres under Alternative C, a similar number of acres as under Alternative A (See *Disturbance Appendix*). Alternative C would allow surface-disturbing activities in all 100-year floodplains and on waterbodies provided there were no practicable alternative locations and the activity would meet the requirements of Executive Order 11988 and federal and state water quality requirements, which would conserve water resources. Alternative C would allow oil and gas development in these areas with a CSU stipulation, which would conserve water resources. These stipulations would conserve 96,000 acres of 100-year floodplains and 39,000 acres of waterbodies, while non-discretionary closures would maintain an additional 840 acres of 100-year floodplains and 730 acres of waterbodies (Table 4-20). The projected number of wells and associated surface disturbance under Alternative C would result in an estimated disturbance over the planning period of 61 acres of disturbance on 100-year floodplains and 24 acres on waterbodies (Table 4-21). Impacts to water quality under Alternative C would be moderately less beneficial than under Alternative B but slightly more beneficial than under Alternative A.

Alternative C would allow surface-disturbing activities and oil and gas development in State-designated SWPAs with mitigation measures sufficient to conserve surface and groundwater quality. Oil and gas development under Alternative C would be anticipated to result in 3 acres of surface disturbance in SWPAs (Table 4-21). Impacts to surface and groundwater quality in SWPAs would be moderately more beneficial than under Alternative A but slightly less beneficial than under Alternative B.

Resources

Management actions under Alternative C that prohibited surface-disturbing activities would prevent the completion of 120 acres of riparian-wetland enhancement projects, 120 acres of watershed enhancement projects, 2,500 acres of mechanical treatments for vegetation, 120 acres of aquatic habitat enhancement projects, and 120 acres of wildlife habitat enhancement projects (See *Disturbance Appendix*). Alternative C would slightly reduce the number of resource improvement projects compared to Alternative A, but would substantially increase them compared to Alternative B.

Alternative C would avoid surface-disturbing activities and oil and gas development on sensitive soils unless the activity could be effectively designed to limit soil erosion, soil compaction, and overland flow, which would conserve water resources. Surface-disturbing activities would be allowed on badlands and rock outcrop with mitigation measures to maintain or improve the stability of these areas, which would maintain water quality. Oil and gas development would be allowed on sensitive soils, badlands, and rock outcrop with a CSU stipulation, which would conserve water quality. Impacts from soils management actions to water quality under Alternative C would be slightly less beneficial than under Alternative B but slightly more beneficial than under Alternative A.

Alternative C would allow surface-disturbing activities in riparian-wetland areas provided there were no practicable alternative locations and the activity would meet the requirements of Executive Order 11990, CWA wetland protections, and federal and state water quality requirements, which would have a beneficial impact on water quality. Alternative C would allow oil and gas development in these areas with a CSU stipulation, which would conserve water resources. This CSU stipulation would conserve 150,000 acres of riparian areas adjacent to waterbodies. However, maintaining adequate vegetated buffers adjacent to riparian-wetland areas would not be required, which would increase the risk of adverse impacts to water resources. Impacts from riparian-wetlands management actions to water quality under Alternative C would be moderately less beneficial than under Alternative B but slightly more beneficial than under Alternative A.

Alternative C would allow surface-disturbing activities in areas of invasive species infestations with mitigation measures to reduce the spread of invasive species infestations, which would reduce impacts to water resources. Impacts from invasive species management actions to water quality under Alternative C would be slightly less beneficial than under Alternative B but moderately more beneficial than under Alternative A.

Alternative C management actions designed to protect wildlife and special status species habitat from the impacts of surface-disturbing activities would prevent the adverse impacts to water resources associated with these activities. Alternative C limits moderately less surface disturbance than Alternative A but substantially less than Alternative B. Less surface disturbance would mean fewer adverse impacts to water resources.

Resource Uses

Alternative C would allow new surface water impoundments with mitigation measures to maintain the natural flow regime and watershed functionality. Approximately 530 surface water impoundments would be constructed, disturbing 530 acres (See *Disturbance Appendix*). Impacts from surface water impoundments to water resources under Alternative C would be similar to those under Alternative B and substantially more beneficial than those under Alternative A.

Alternative C would manage forestlands for forest health and for a diversity of forest products. Timber harvest activities under Alternative C would result in surface disturbance on 2,600 acres, which would substantially increase adverse impacts to water resources (See *Disturbance Appendix*). Impacts to water resources under Alternative C would be moderately more adverse than those under Alternatives A or B.

Alternative C livestock grazing management would have a substantially more beneficial impact to water resources than Alternative A but a slightly less beneficial impact than Alternative B. New spring developments would be prohibited in riparian-wetland areas. Alternative C would prohibit the placement of livestock water developments in riparian-wetland areas unless they would benefit water resources, which would have a neutral to slightly beneficial impact to water quality. Management actions related to locatable mining, oil and gas development, and coal mining would be similar to Alternative B, which would be slightly more beneficial to water quality than Alternative A. Alternative C would defer livestock grazing following fire activities until the area attained vegetative objectives, which would have a more beneficial impact to water resources than Alternatives A or B.

Under Alternative C, surface disturbance from minerals development could impact 17,000 acres of BLM-administered mineral estate (See *Disturbance Appendix*). Alternative C would increase the amount and severity of surface disturbance related to minerals development substantially compared to Alternative B, which could increase adverse impacts to water resources as overland flow and sediment increase above natural levels. Although the amount would be similar, the severity of surface disturbance related to oil and gas development under Alternative C would be slightly more adverse to water resources than under Alternative A because the NSO stipulation in that alternative would be replaced by a less restrictive CSU stipulation. For a comparison of water resources maintained, conserved, and at risk from oil and gas development among the alternatives, see Table 4-20. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on BLM-administered mineral estate would use an estimated 260 to 520 acre-feet of freshwater. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents only 5-11 percent of a single day's surface and groundwater withdrawals for irrigation use within the planning area. Impacts from water withdrawals for hydraulic fracturing

would be short-term and minor. See *Water Resources – Management Common to All* and the *Minerals Appendix – Completion Operations* for information on potential sources of water.

Impacts to surface and groundwater quality and quantity from BLM-authorized oil and gas development within the proposed Carter MLP area would be the same as those impacts that occurred outside the proposed MLP area.

Areas of concentrated open off-highway vehicle use (640 BLM-administered acres) would result in erosion, sedimentation, and soil compaction, which would have an adverse impact on water quality. The functionality of 160 acres of floodplains and 10 acres of waterbodies within the open off-highway vehicle areas would be impacted. See *Impacts Common to All Alternatives* above for impacts of surface-disturbing activities specific to floodplains and waterbodies.

Alternative C would open substantially less acreage for ROWs than Alternative A and would manage more area as ROW avoidance and exclusion areas. The reduction in ROW surface disturbance under Alternative C would likely result in fewer adverse impacts to water resources than Alternative A but more adverse impacts than under Alternative B.

ALTERNATIVE D

Summary Statement

Water resource management under Alternative D would be similar to Alternative C and would result in similar impacts to water resources. Management actions under Alternative D would reduce threats to water quality compared to Alternative A, meet Montana State Water Quality Standards, and support the beneficial uses of waterbodies. In situations where water quality or beneficial uses were threatened, the BLM would take corrective action as required by existing regulations. Impacts to water quality under Alternative D would be moderately less beneficial than under Alternative B but slightly more beneficial than under Alternative A.

Resources

Management actions under Alternative D that prohibited surface-disturbing activities would have similar impacts as under Alternative A in regards to resource improvement projects and their long-term benefits to water resources.

Alternative D would allow surface-disturbing activities on sensitive soils, badlands, and rock outcrop with mitigation measures or stipulations to maintain or improve the stability of the site, which would conserve water resources. Oil and gas development would be allowed with a CSU stipulation, which would conserve water resources. Impacts to water quality under Alternative D would be slightly less beneficial than under Alternative B but slightly more beneficial than under Alternatives A or C.

Alternative D riparian-wetland areas management would be similar to Alternative C and would result in similar impacts to water resources. Impacts to water quality under Alternative D would be moderately less beneficial than under Alternative B but slightly more beneficial than under Alternative A.

Surface-disturbing activities in areas of invasive species infestations would be managed the same under Alternative D as under Alternative C. Impacts to water quality under Alternative D would be slightly less beneficial than under Alternative B but moderately more beneficial than under Alternative A.

Alternative D would be similar to Alternative C in the amount of surface disturbance prevented by wildlife management actions, except that Alternative D would prevent less surface disturbance with regards to black-tailed prairie dog colonies, greater sage-grouse general habitat areas, and greater sage-grouse priority areas. Alternative D would limit slightly less surface disturbance than Alternative C, moderately more than Alternative A, and substantially more than Alternative B. Less surface disturbance would mean fewer indirect adverse impacts to water resources.

Resource Uses

Alternative D would allow new surface water impoundments with mitigation measures to maintain the natural flow regime and watershed functionality. Approximately 710 surface water impoundments would be constructed, disturbing 710 acres (See *Disturbance Appendix*). Impacts to water resources under Alternative D would be similar to those under Alternatives B and C and substantially more beneficial than those under Alternative A.

Alternative D would manage forestlands for forest health and for a diversity of forest products. Impacts to water resources under Alternative D would be similar to those under Alternative C.

Alternative D livestock grazing management actions would be the same as those under Alternative C, with the exception that new spring developments would be allowed with mitigation measures to maintain or exceed to integrity, functionality, and resiliency of the associated waterbody and livestock grazing would be allowed following vegetative treatments after established seed set the next growing season. Impacts to water resources from livestock grazing management actions under Alternative D would be similar to those under Alternative C. Alternative D livestock grazing management would have a substantially more beneficial impact to water resources than Alternative A but a slightly less beneficial impact than Alternative B.

The amount and severity of surface disturbance to water resources related to minerals development under Alternative D would be similar to that under Alternative C. For a comparison of water resources maintained, conserved, and at risk from oil and gas development among the alternatives, see Table 4-20. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on BLM-administered mineral estate would use an estimated 270 to 530 acre-feet of freshwater. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents only 6-11 percent of a single day's surface and groundwater withdrawals for irrigation use within the planning area. Impacts from water withdrawals for hydraulic fracturing would be short-term and minor. See *Water Resources – Management Common to All* and the *Minerals Appendix – Completion Operations* for information on potential sources of water.

Areas of concentrated open off-highway vehicle use (2,000 BLM-administered acres) would result in erosion, sedimentation, and soil compaction, which would have an adverse impact on water quality. The functionality of 190 acres of floodplains and 20 acres of waterbodies within the open off-highway vehicle areas would be impacted. See *Impacts Common to All Alternatives* above for impacts of surface-disturbing activities specific to floodplains and waterbodies.

Alternative D would open substantially less acreage for ROWs than Alternative A and manage more area as ROW avoidance and exclusion areas. The reduction in surface disturbance under Alternative D would likely result in fewer adverse impacts to water resources than Alternative A but more adverse impacts than Alternatives B or C.

ALTERNATIVE E (Proposed)

Summary Statement

Water resource management under Alternative E would result in moderately more beneficial impacts to water resources than under Alternatives A, C, and D, but slightly less beneficial impacts than under Alternative B. Management actions under Alternative E would reduce threats to water quality compared to Alternative A, meet Montana State Water Quality Standards, and support the beneficial uses of waterbodies. In situations where water quality or beneficial uses were threatened, the BLM would take corrective action as required by existing regulations. The number of acres disturbed by surface-disturbing activities on BLM-administered surface and mineral estate under Alternative E would be similar to Alternative D (See *Disturbance Appendix*). Alternative E would allow surface-disturbing activities in 100-year floodplains and on waterbodies provided there were no practicable alternative locations and the activity would meet the requirements of Executive Order 11988 and federal and state water quality requirements, which would have a beneficial impact on water quality. Alternative E would offer oil and gas leasing and development in these areas with an NSO stipulation. These stipulations

along with non-discretionary closures would maintain 97,000 acres of 100-year floodplains and 40,000 acres of waterbodies, which would maintain water resources (Table 4-20). The projected number of wells and associated surface disturbance under Alternative E would result in an estimated disturbance over the planning period of 37 acres of disturbance on 100-year floodplains and 14 acres on waterbodies (Table 4-21). Impacts to water quality under Alternative E would be moderately less beneficial than those under Alternative B but slightly to moderately more beneficial than those under Alternatives A, C, or D.

Alternative E would allow surface-disturbing activities in SWPAs with mitigation measures to minimize adverse impacts to surface and groundwater quality, which would result in beneficial impacts to surface and groundwater quality. Oil and gas development would be allowed with an NSO stipulation, which would maintain water quality. Oil and gas development under Alternative E would be anticipated to result in 2 acres of surface disturbance in SWPAs (Table 4-21). Impacts to surface and groundwater quality in SWPAs would be moderately more beneficial than under Alternative A, slightly more beneficial than under Alternatives C and D, but slightly less beneficial than under Alternative B.

Resources

Management actions under Alternative E that prohibited surface-disturbing activities would have similar impacts as under Alternatives A and C in regards to resource improvement projects and their long-term benefits to water resources.

Alternative E would allow surface-disturbing activities on sensitive soils, badlands, and rock outcrop with mitigation measures to maintain or improve the stability of the site, which would result in beneficial impacts to water quality. Oil and gas development would be offered with a CSU stipulation on sensitive soils and an NSO stipulation on badlands and rock outcrop, which would conserve or maintain water quality. Impacts to water quality under Alternative E would be somewhat less beneficial than those under Alternative B but more beneficial than those under Alternatives A, C, or D.

Alternative E would allow surface-disturbing activities in riparian-wetland areas with mitigation measures to maintain or exceed the functionality and resiliency of the area and would allow oil and gas development with an NSO stipulation, which would maintain water quality. This NSO stipulation would maintain 150,000 acres of riparian-wetland areas adjacent to waterbodies. In addition, Alternative E would establish a 300-foot vegetated buffer on riparian-wetland areas. Surface-disturbing activities within this buffer would be allowed with mitigation measures to maintain or exceed the functionality and resiliency of the associated riparian-wetland area, and oil and gas development would be offered with a CSU stipulation, which would conserve water quality. This stipulation would conserve an additional 1,200,000 acres adjacent to riparian-wetland areas and their associated waterbodies, which would reduce adverse impacts to water resources. Impacts to water quality from riparian-wetland area management under Alternative E would be moderately more beneficial than those under Alternatives B, C, and D and substantially more beneficial than those under Alternative A.

Surface-disturbing activities in areas of invasive species infestations are managed the same under Alternative E as under Alternatives C and D. Impacts to water quality under Alternative E would be slightly less beneficial than those under Alternative B but moderately more beneficial than those under Alternative A.

Alternative E management actions designed to protect wildlife and special status species habitat from the impacts of surface-disturbing activities would have impacts similar to those under Alternative D.

Resource Uses

Alternative E would allow new surface water impoundments with mitigation measures to maintain water quality and watershed functionality. Approximately 710 surface water impoundments would be constructed, disturbing 710 acres (See *Disturbance Appendix*). Impacts to water resources under Alternative E would be similar to those under Alternatives B, C and D and substantially more beneficial than those under Alternative A.

Alternative E would manage forestlands for forest health and for a diversity of forest products. Impacts to water resources under Alternative E would be similar to those under Alternative D, and moderately more adverse than those under Alternatives A, B, or C.

Alternative E livestock grazing management actions would be the same as those under Alternative C, with the exception that new spring developments would be allowed with mitigation measures and new livestock water developments would be allowed within 0.25 miles of riparian-wetland areas with mitigation measures. Impacts to water resources from livestock grazing management actions under Alternative E would be similar to those under Alternative C. Alternative E livestock grazing management would have a substantially more beneficial impact to water resources than Alternative A but a slightly less beneficial impact than Alternative B.

Under Alternative E, surface disturbance from minerals development could impact 16,000 acres of BLM-administered mineral estate (See *Disturbance Appendix*). Alternative E would increase the amount and severity of surface disturbance related to minerals development substantially compared to Alternative B, which could increase adverse impacts to water resources as overland flow and sediment increased above natural levels. Alternative E would decrease the amount of surface disturbance related to minerals development slightly compared to Alternatives A, C, and D. Alternative E would decrease the severity of surface disturbance related to oil and gas development compared to Alternatives C and D because the less restrictive CSU stipulation in those alternatives would be replaced by an NSO stipulation. For a comparison of water resources maintained, conserved, and at risk from oil and gas development among the alternatives, see Table 4-20. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on BLM-administered mineral estate would use an estimated 250 to 490 acre-feet of freshwater. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents only 5-10 percent of a single day's surface and groundwater withdrawals for irrigation use within the planning area. Impacts from water withdrawals for hydraulic fracturing would be short-term and minor. See *Water Resources – Management Common to All* and the *Minerals Appendix – Completion Operations* for information on potential sources of water.

Not authorizing areas of concentrated open off-highway vehicle use would limit erosion, sedimentation, and soil compaction, which would maintain water quality.

Alternative E would open slightly more acreage for ROWs than Alternative A and manage substantially more area as ROW avoidance areas. Surface disturbance under Alternative E would likely result in fewer adverse impacts to water resources than Alternative A, slightly more adverse impacts than Alternatives C or D, and substantially more adverse impacts than Alternative B.

CUMULATIVE IMPACTS

Past and present land use, dams, natural events, changes in local and global climatic patterns, and management actions impact water resources. Impacts would increase as human populations increased and expanded. Management of water resources is complicated by scattered land ownership because water is connected throughout a watershed (longitudinally from headwaters downstream; laterally through interactions with floodplains, riparian areas, and uplands; vertically through interactions with the substrate and subsurface; and temporally).These interactions compound the impacts of all land management and land use throughout an entire watershed.

Erosive soils and arid climate across the planning area form hydrologic systems prone to erosion, channel degradation, downcutting, accelerated lateral cutting, and sedimentation. These systems have high levels of natural instability and rapid degradation can occur from human disturbance (Elmore and Kauffman 1994). Within uplands, the amount of vegetation and natural erosion control is limited by the climate. Prior to European settlement, integral factors in watershed health in the form of disturbances such as fire, beaver activity, occasional or patchy large ungulate herbivory and flooding were common across the landscape. Beaver (*Castor canadensis*) influenced nutrient cycling, water temperature, residence time of water, aquatic habitat, vegetation dispersal, and riparian community structure. The extirpation of beaver through trapping influenced the composition, structure, and function of stream systems by decreasing surface water availability, reducing channel diversity, and converting wetland communities to xeric plant communities

(Elmore and Kauffman 1994). Prior to their near extinction during the mid-1800s, bison (*Bison bison*) roamed the area in large herds, consuming vegetation in the uplands and riparian and wetland areas. Although local increases in soil bulk density at bison stream crossings decreased water infiltration and accelerated fluvial erosion, disturbance of streams was spatially and temporally minimized because bison distribution patterns were unaffected by slope or proximity to water (Fritz, Dodds, and Pontius 1999; Fleischner 1994), they grazed in patches, ranged over large areas, and typically crossed creeks at specific locations (Fritz et al. 1999).

An influx of livestock to eastern Montana beginning in the 1860s has altered stream and river ecosystems. Livestock grazing has degraded about 80 percent of stream and riparian ecosystems in the arid western United States. Livestock grazing alters watershed hydrology by increasing overland flow, the volume of peak flows, and floodwater velocity; lowering the water table; and decreasing low flows and infiltration rates (Belsky et al. 1999). Livestock grazing accelerates soil erosion, reduces riparian vegetation, increases water temperature, decreases dissolved oxygen, degrades the stream channel, and introduces pollutants such as sediment, salinity, bacteria, and nutrients (MDEQ 2012b). Wide and shallow channels, high sediment yield, and high turbidity characterize grazing-disturbed streams (Magilligan and McDowell 1997). Because livestock spend a disproportionate amount of time in riparian areas for forage, shade, and water (Belsky et al. 1999; Saunders and Fausch 2007), heavy use, particularly in riparian areas, leads to major changes in stream morphology, water quality, and water availability. Grazing practices, particularly year-long grazing, have resulted in increased sedimentation, declines in woody species and deep-rooted vegetation, soil compaction, increased overland flow, accelerated erosion, decreased water quality, and extreme instability of stream channels. During high flows, channel instability created over-widened or incised channels, eventually lowering the water table. The Taylor Grazing Act of 1934 addressed overgrazing of federal lands by attempting to reduce livestock numbers (Elmore and Kauffman 1994).

Beginning in the late 19th and early 20th century, surface disturbances such as homesteading, mining, OHV use, infrastructure development, community development, agriculture, and the introduction of invasive species has affected channel morphology and resulted in soil compaction, increased overland flow and sedimentation, accelerated erosion, and decreased water quality. Soil compaction and the presence of impervious surfaces have reduced infiltration and increased overland flow, which results in increased channel degradation, sedimentation, and reduced water quality and quantity.

Farming and grazing drastically changed native vegetation. Cropland development and drought in 1919 and the 1930s resulted in accelerated wind erosion of agricultural lands. Since the 1930s, flood control, irrigation development, and wetland conversion have modified stream channels through in-stream structures, channelization, bank modification, and placement of riprap (Elmore and Kauffman 1994). OHV use, particularly during wet conditions, has caused rutting, erosion, stream channel degradation and established roads and trails. Many of these surface disturbances continue to degrade water quality.

Since the late 19th century, federal and state regulations have improved water quality. The Rivers and Harbors Act of 1899 (33 U.S.C. 403 10) preserved water quality by requiring permits for refuse discharge and channel alteration of navigable waters and their tributaries. Water quality has been improved through the establishment of water quality standards through the Water Pollution Control Act of 1948, Federal Water Pollution Control Act in 1956, and the Water Quality Act of 1965. The Clean Air Act of 1970 and Clean Air Act Amendments of 1990 have reduced atmospheric deposition of pollutants. In 1972, the Clean Water Act created regulations for reducing point source and nonpoint source pollution. The Water Quality Act of 1987 established numeric criteria for toxic pollutants to reduce impairment of beneficial uses.

Scattered land ownership and the absence of watershed-wide management strategies have complicated efforts for ongoing conservation and restoration. Water resources are influenced by land use throughout an entire watershed. Multiple land uses would compound land uses and cause impacts greater than impacts caused by the individual land uses alone. Land use within watersheds of the planning area is approximately 65 percent rangeland, 26 percent agriculture, 7 percent forest, less than 1 percent mines or quarries, and less than 1 percent urban or developed (MNRIS 2010).

The BLM's ability to influence future conditions in watersheds is limited by scattered and minority land ownership in many watersheds. Activity that occurs adjacent to BLM-administered lands would impact water resources on BLM-administered land. Activities occurring on BLM-administered lands or adjacent to BLM-administered lands (including livestock grazing, agriculture, urbanization, fire suppression, mineral exploration and development, weed infestation, OHV use, and pollution, decrease watershed health and water quality), cause accelerated erosion, increased overland flow, decreased infiltration, channel degradation, atmospheric deposition of pollutants, and degradation of water quality through increased sedimentation, turbidity, nutrients, eutrophication, metals, and other pollutants in waterbodies. These activities have resulted in 14 percent of the assessed stream miles becoming listed as impaired or threatened (see the *Water Appendix*). Crop and livestock production compose the largest percentage of nonpoint source pollution in Montana and is the most common anthropogenic contributor to stream impairment in the planning area (MDEQ 2012b). Fire suppression has increased fire severity and intensity, leading to increased overland flow, erosion, and sedimentation.

Overgrazing in riparian areas; historical impacts to stream morphology and groundwater; and the construction of numerous impoundments, spring developments, and stream crossings contribute to disconnection within the watershed. Connectivity is essential for the cycling of water, nutrients, and sediment throughout the watershed. Continued degradation of stream channels and riparian areas would result in accelerated loss of water resources and hydrologic function. The cumulative impacts of grazing; local geology; soils; agricultural practices; and surface-disturbing activities within uplands, riparian areas, and stream channels have contributed to accelerated erosion and increased sedimentation. Sedimentation from activities in the upper watershed is compounded as these drainages combine and flow into larger streams and rivers.

Produced water from oil, gas, CBNG, and coal development in Wyoming and Montana impacts the quality and quantity of surface water and groundwater through impoundments, injection, and discharge; impacts caused by these activities would be mitigated by permits. The combination of these activities increases the potential for degradation of water quality. The total amount of water produced by CBNG wells within the PRB in Wyoming and Montana during 2007 was approximately 85,000 acre-feet from approximately 5,500 wells (Wheaton, Reddish-Kuzara, Meredith, and Donato 2008). Although surface water quality in some watersheds would be altered in combination with new and existing permits and developments in Wyoming and Montana, beneficial uses would not be diminished. Surface water flow would moderately increase alteration of the natural hydrologic regimes (such as changes in the magnitude and timing of low and peak flows) and cause erosion and increased sedimentation (BLM 2008g). Discharge of sodic and saline water from CBNG development and the use of seepage ponds to dispose of this water cause cumulative impacts to water quality.

Hydrologic resources would be vulnerable to the impacts of climate change and mitigation or a reduction of these effects would reduce the impacts on water resources (see *Chapter 3, Water* for more information). Conversely, activities that exacerbated the effects of climate change would increase the vulnerability of water resources to impacts. Water conservation measures (including limiting the number of impoundments, limiting surface and groundwater withdrawal, and increasing irrigation efficiency) would reduce the vulnerability of water resources to climate change. Conversely, expanded water use, withdrawals, and storage would exacerbate the impacts of climate change on water resources (IPCC 2007).

Alternative A (No Action)

Alternative A would contribute to a moderate risk of adverse impacts to water quality; however, water quality standards would be met and beneficial uses maintained. Buffers would not be established to reduce nonpoint source pollution and non-oil and gas surface disturbance would be allowed in waterbodies, floodplains, wetlands, and riparian areas. Surface disturbance associated with oil and gas activities would be allowed in wetlands, floodplains of non-major rivers, and 80 percent of the federal mineral estate in the planning area without stipulations. Surface disturbance in areas of sensitive soils, soils with poor reclamation potential, and highly erodible soils would reduce water quality and result in long-term to permanent increases in sedimentation.

Surface disturbance would be allowed on 2.6 million acres of BLM-administered surface under this alternative. Oil, gas, and CBNG activities throughout the planning area would cause short-term surface

disturbance on 18,000 acres, with 19 percent occurring through activities on BLM-administered mineral estate. There would be 6,600 acres of long-term surface disturbance, with 16 percent occurring on BLM-administered mineral estate. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on all mineral estate would use an estimated 17,900 to 36,100 acre-feet of freshwater, with 1 to 3 percent being used to hydraulically fracture wells on BLM-administered mineral estate. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents approximately 4 to 8 days of surface and groundwater withdrawals for irrigation use within the planning area.

Management actions proposed under Alternative A have historically led to areas with reduced water quality. If this were to continue, the BLM would continue taking corrective action to limit the duration of impacts to water quality. However, the water quality of streams flowing through BLM-administered lands is often a function of management occurring on multiple ownerships. BLM-administered lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM would continue to take corrective action to reduce its contribution of nonpoint source pollution. However, since nonpoint source pollution management is voluntary, some level of nonpoint source pollution from non-BLM-administered lands will continue to affect most streams within the planning area. As the MDEQ develops TMDLs within the planning area, some of these other sources may be reduced, which would result in an overall improvement to water quality.

In summary, the BLM's contribution to water quality would remain similar to current levels, while contributions from other sources would likely be maintained or reduced.

Alternative B

Alternative B would contribute to a reduced risk of adverse impacts to water quality, water quantity, and watershed health compared to Alternative A. Water resources would be maintained or improved through reduced livestock grazing, restricted OHV use, and restricted or prohibited surface disturbance, particularly in and near waterbodies, floodplains, and riparian-wetland areas. These actions would increase riparian-wetland vigor and decrease impacts from surface disturbance in upland areas. The physical and biological connections between riparian-wetland areas and their associated waterbodies would be maintained, which would improve water quality by decreasing sedimentation and nonpoint source pollution.

Surface disturbance would be allowed on 560,000 acres of BLM-administered surface under this alternative. Oil, gas, and CBNG activities throughout the planning area would cause surface disturbance on 17,000 acres, with 13 percent occurring through activities on BLM-administered mineral estate. There would be 6,200 acres of long-term surface disturbance, with 11 percent occurring on BLM-administered mineral estate. The elimination of several future oil, gas, and CBNG field development projects (because sufficient BLM-administered mineral estate would not be available) under this alternative would maintain water quality. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on all mineral estate would use an estimated 17,700 to 35,600 acre-feet of freshwater, with 1 to 2 percent being used to hydraulically fracture wells on BLM-administered mineral estate. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents approximately 4 to 7 days of surface and groundwater withdrawals for irrigation use within the planning area.

Management actions proposed under Alternative B would reduce the amount of nonpoint source pollution produced and improve water quality. In areas where impacts occur, the BLM would continue taking corrective action to limit the duration of impacts to water quality. However, the water quality of streams flowing through BLM-administered lands is often a function of management occurring on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM would continue to take corrective action to reduce its contribution of nonpoint source pollution. However, since nonpoint source pollution management is voluntary, some level of nonpoint source pollution from non-BLM-administered lands will continue to affect most streams within the planning area. As the MDEQ develops TMDLs within the planning area, some of these other sources may be reduced, which would result in an overall improvement to water quality.

In summary, the BLM's contribution of nonpoint source pollution would be reduced, which could result in an improvement to water quality. The actual resultant water quality would be dependent on contributions from other sources, which would likely be maintained or reduced.

Alternative C

Alternative C would contribute to declines in water quality and quantity. Water resources would be conserved by avoiding surface-disturbing activities in floodplains and waterbodies and only allowing them with measures to minimize impacts to these resources. However, oil and gas development would be allowed in floodplains, waterbodies, and riparian-wetland areas with a CSU stipulation. Alternative C would allow new livestock water developments at least 0.25 miles from perennial and intermittent streams but would apply minimal restrictions in ephemeral streams. Surface water impoundments would be allowed with measures to maintain the natural flow regime and watershed functionality. Spring developments would not be allowed. The long-term cumulative impacts from these actions would include the loss of hydrologic connectivity within the watershed, altered channel morphology and hydrologic flow regime, increased sedimentation, and reduced water quality.

Surface disturbance would be allowed on 2.6 million acres of BLM-administered surface under this alternative. Oil, gas, and CBNG activities throughout the planning area would cause surface disturbance on 18,000 acres, with 19 percent occurring through activities on BLM-administered mineral estate. There would be 6,600 acres of long-term surface disturbance, with 16 percent occurring on BLM-administered mineral estate. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on all mineral estate would use an estimated 17,900 to 36,200 acre-feet of freshwater, with 1 to 3 percent being used to hydraulically fracture wells on BLM-administered mineral estate. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents approximately 4 to 8 days of surface and groundwater withdrawals for irrigation use within the planning area.

Management actions proposed under Alternative C would increase the amount of nonpoint source pollution produced and potentially reduce water quality. In areas where impacts occur, the BLM would continue taking corrective action to limit the duration of impacts to water quality. However, the water quality of streams flowing through BLM-administered lands is often a function of management occurring on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM would continue to take corrective action to reduce its contribution of nonpoint source pollution. However, since nonpoint source pollution management is voluntary, some level of nonpoint source pollution from non-BLM-administered lands will continue to affect most streams within the planning area. As the MDEQ develops TMDLs within the planning area, some of these other sources may be reduced, which would result in an overall improvement to water quality.

In summary, the BLM's contribution to nonpoint source pollution would be increased and potentially reduce water quality in the short-term. The actual resultant water quality would be dependent on contributions from other sources, which would likely be maintained or reduced.

Alternative D

Alternative D would cause a decline in water quality, water quantity, and overall watershed health. Buffers would not be established to reduce impacts from upland surface disturbance and surface disturbances would be allowed in waterbodies, floodplains, wetlands, and riparian areas. The long-term cumulative impacts from these actions would include the loss of hydrologic connectivity within the watershed, altered channel morphology and hydrologic flow regime, increased sedimentation, and reduced water quality.

Surface disturbance would be allowed on 2.6 million acres of BLM-administered surface under this alternative. Oil, gas, and CBNG activities throughout the planning area would cause surface disturbance on 18,000 acres, with 19 percent occurring through activities on BLM-administered mineral estate. There would be 6,600 acres of long-term surface disturbance, with 16 percent occurring on BLM-administered mineral estate. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on all mineral estate would use an estimated 17,900 to 36,200 acre-feet of freshwater, with 1 to 3 percent being used to hydraulically fracture wells on BLM-

administered mineral estate. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents approximately 4 to 8 days of surface and groundwater withdrawals for irrigation use within the planning area.

Management actions proposed under Alternative D would increase the amount of nonpoint source pollution produced and potentially reduce water quality. In areas where impacts occur, the BLM would continue taking corrective action to limit the duration of impacts to water quality. However, the water quality of streams flowing through BLM-administered lands is often a function of management occurring on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM would continue to take corrective action to reduce its contribution of nonpoint source pollution. However, since nonpoint source pollution management is voluntary, some level of nonpoint source pollution from non-BLM-administered lands will continue to affect most streams within the planning area. As the MDEQ develops TMDLs within the planning area, some of these other sources may be reduced, which would result in an overall improvement to water quality.
In summary, the BLM's contribution to nonpoint source pollution would be increased and potentially reduce water quality in the short-term. The actual resultant water quality would be dependent on contributions from other sources, which would likely be maintained or reduced.

Alternative E (Proposed)

Alternative E would maintain water quality and quantity through restricted OHV use, use of buffers to reduce nonpoint source pollution, and restricted or prohibited surface disturbance, particularly in and near streams, waterbodies, floodplains, and riparian-wetland areas. Alternative E would require the maintenance of watershed and riparian functionality during water developments.

Surface disturbance would be allowed on 2.7 million acres of BLM-administered surface under this alternative. Oil, gas, and CBNG activities throughout the planning area would cause surface disturbance on 18,000 acres, with 17 percent occurring through activities on BLM-administered mineral estate. There would be 6,500 acres of long-term surface disturbance, with 15 percent occurring on BLM-administered mineral estate. Hydraulic fracturing of Bakken and Three Forks Formation oil wells on all mineral estate would use an estimated 17,900 to 36,000 acre-feet of freshwater, with 1 to 3 percent being used to hydraulically fracture wells on BLM-administered mineral estate. For comparison purposes, this 20-year total of freshwater use for hydraulic fracturing represents approximately 4 to 8 days of surface and groundwater withdrawals for irrigation use within the planning area.

Management actions proposed under Alternative E would reduce the amount of nonpoint source pollution produced and improve water quality. In areas where impacts occur, the BLM would continue taking corrective action to limit the duration of impacts to water quality. However, the water quality of streams flowing through BLM-administered lands is often a function of management occurring on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM would continue to take corrective action to reduce its contribution of nonpoint source pollution. However, since nonpoint source pollution management is voluntary, some level of nonpoint source pollution from non-BLM-administered lands will continue to affect most streams within the planning area. As the MDEQ develops TMDLs within the planning area, some of these other sources may be reduced, which would result in an overall improvement to water quality.

In summary, the BLM's contribution of nonpoint source pollution would be reduced, which could result in an improvement to water quality. The actual resultant water quality would be dependent on contributions from other sources, which would likely be maintained or reduced.

VEGETATION

This section describes potential impacts to native plant communities, including sensitive plants, from resource management actions and resource use programs. Impacts to plant community's result from surface-disturbing activities, including fire and drought, and activities that remove vegetation or mechanically impact plants.

FLPMA and the Standards for Rangeland Health direct the BLM to manage vegetation resources toward the maintenance and/or restoration of the physical function and biological health of these communities. The objectives are to maintain and improve the condition and trend of these plant communities within their respective ecological sites. This would provide for many resources and resource uses within these sites. Examples include beneficial impacts to livestock grazing, wildlife habitat, recreation, and soil and water and resiliency to climate change.

SUMMARY OF IMPACTS

Impacts to plant communities occur in two fundamental ways. Plant community composition can shift or vegetation can be lost. Plant community shifts occur over time and can be influenced by factors such as drought, timing, intensity, duration of herbivory, fire and invasive species. Plant species composition can shift within communities, or plant communities can change over time from early colonizers to later more stable species. Vegetation losses occur through temporary (short-term or long-term) surface disturbing activities or permanent (long-term) allocation of those areas to other uses (roads, well pads, etc.) All alternatives entail surface-disturbing activities that remove vegetation, and all alternatives provide for reclamation of surface disturbances unless allocated to other uses. Alternatives allowing more vegetation treatments (restoration projects) would provide for ecological health by maintaining or moving plant communities toward those reflective of desired communities in appropriate ecological sites. Table 1 in the *Disturbance Appendix* shows estimated acres of long and short-term surface disturbance by alternative for resources and resource uses.

Alternatives allowing more surface disturbance or development, will generally impact more acres of plant communities depending on timing and effectiveness of reclamation. Managing resource uses for meeting Land Health Standards will maintain or provide for plant communities.

Alternatives that reduce opportunity to treat vegetation would shift some plant communities away from desired plant communities. For example weed control efforts may be limited where vehicle access is limited or risk of severe wildfire may be increased where vegetation treatment opportunities are limited.

ASSUMPTIONS AND METHODOLOGY

Short-term effects to vegetation would be the most prevalent at any given time depending on reclamation timing and effectiveness. Longer term effects to vegetation would occur less often, but impact plant communities longer.

Effects of surface disturbance would impact a fraction of the total acres projected for this alternative at any given time depending on type (short vs. long-term) and timing of disturbance.

Emergency stabilization and rehabilitation vegetation treatments are addressed in *Wildland Fire Management and Ecology*.

Vegetation treatment acres proposed under an emergency stabilization and rehabilitation plan are not included under other restoration proposals. For example, a plan to restore a Wyoming big sagebrush and prairie grassland association might call for 10,000 acres of seeding desirable species. An emergency stabilization and rehabilitation plan written for a large wildfire might propose 10,000 acres of seeding native species. However, acres treated for vegetation restoration and analyzed in this RMP do not include those that would be proposed under an emergency stabilization and rehabilitation plan.

Implementing NSO stipulations for oil and gas, leasing and development and removing federal acreage from leasing would correlate directly to the reduction of federal oil and gas wells, as predicted in the RFD (see the *Minerals Appendix*) and result in fewer acres of surface disturbance in the planning area. For example, if NSO stipulations for oil and gas, leasing and development or no-leasing decisions affected 10 percent of the federal mineral estate under an alternative, there would be a corresponding 10-percent reduction in the number of BLM-administered oil and gas wells predicted under the RFD.

Conversely, mitigation, specialized design features, and CSU stipulations for oil, and gas leasing and development would not correlate directly to the reduction of federal oil and gas wells or acres of surface disturbance.

Some special status plant species and habitats for other species occur in the planning area. Designation of critical habitat or special considerations for the management of these plant species (known populations or discovered) could impact plant communities. Management for plant and wildlife species designated as threatened or endangered under the ESA or designated as special status species by the BLM can affect resource uses in areas in which these special status species occurred. Specifically, restrictions on the type, location, or period in which consumptive use activities were allowed to occur could limit management options on lands containing special status species and, in turn, could affect vegetative communities; for example, surface use restrictions could affect development or placement of range improvement projects.

IMPACTS COMMON TO ALL ALTERNATIVES

Actions that limited surface disturbance would maintain most vegetation resources. Surface-disturbing activities would cause vegetation removal, soil compaction, and soil disturbance. Surface-disturbing activities under all alternatives would include mineral and energy exploration, leasing, and development (including renewable energy and geophysical exploration); OHV and vehicle use; cultural and paleontological excavation; ROWs; land use; infrastructure development; vegetation or fuel treatment (including the sale or harvest of hay, timber, wood, or seed); establishment of wildfire fuel breaks; and implementation of range improvements. Impacts from surface disturbance would typically be localized and short-term. Impacts to vegetation resources would increase as acres of surface disturbance increased within an area. These impacts (the magnitude of which would depend on the condition of upland and riparian vegetation, the efficacy of mitigation, the specific activity and season, and the length of the period preceding reclamation success) would include accelerated erosion, increased overland flow, and increased risk of invasion of weedy or invasive species.

Vegetation treatments would cause short-term disturbance and result in long-term impacts to grassland and shrubland communities. Vegetation treatments that successfully achieved vegetative objectives would increase plant and seral stage diversity, control invasive species, improve wildlife habitat and livestock forage, and create or maintain the desired mosaic. Natural recovery of hardwood draws would be emphasized. A pre-settlement successional pathway would include a disturbance factor (typically fire, insects, or disease) that would reinitiate natural succession of these hardwood ecosystems. Vegetation succession and the health of these hardwood draw communities would be heavily influenced by large ungulates and other competitive plant species.

Treatments to approximate natural disturbance regimes would sustain complexity, diversity, resiliency, and productivity in hardwood draws.

Livestock grazing managed to meet Land Health Standards would provide for the health and productivity of grazing adapted vegetative communities including special status plant species.

Livestock transport of invasive species seed would increase the spread of these species when moving livestock from an allotment infested with invasive species (and the seeds are attached to the hair of the animal or in contained internally in the digestive tract).

Maintaining adaptive ecosystems of the Northern Great Plains would provide for rangeland health by improving plant vigor, increasing vegetative cover, and reducing invasive species infestations. Hoof action would remove vegetation that inhibited new growth, increased cover and vigor of native vegetation, decreased soil erosion, and broke soil crust that would restrict infiltration and inhibit seedling establishment. Healthier plant communities would resist the spread of invasive species and other undesirable plant species. Targeted grazing in areas containing invasive species at crucial points in the species' lifecycle would decrease the spread of invasive species by decreasing seed production or limiting vegetative propagation.

Wildfire and prescribed fires impact grassland and shrubland communities. In the short-term, fire would potentially cause habitat loss and promote the spread of invasive species. In the long-term, because of fire's

historic role in these communities, fire would increase vegetative diversity across the landscape, rejuvenate decadent plants, and improve the overall health of these communities. In shrubland communities, fire impacts, which are typically more long-term than in other communities, depend on the scale and severity of the disturbance. The potential for reestablishment of sagebrush shrublands would depend on the sum of the acreage burned, the distance to seed sources, and the spread of invasive species. Invasive vegetation species, such as cheatgrass, would increase fire frequency, which would prevent shrub establishment. Limiting fire in some cases would reduce direct loss of grassland and shrubland communities and reduce the potential for the spread of invasive species in the short-term. In the long-term, the lack of fire would decrease the overall health of these fire-adapted communities. Fire would enhance age structure, restore vigor, and restore community types through regeneration.

Although fire suppression activities would limit short- and long-term fire damage to vegetation, they would cause mechanical and chemical damage to vegetation and increase the likelihood of the introduction or spread of invasive species. Wildfire suppression tactics would cause short- and long-term impacts to grassland and shrubland communities. If invasive species were already present, the potential for spread would increase regardless of the type of suppression used.

Treating vegetation characteristics and fuel composition to move treatment area condition classes from 2 (moderate departure) to 1 (historical) would maintain vegetative community resiliency to climate change and continue meeting Land Health Standards.

Avoiding or limiting surface disturbance on steeper slopes or highly erodible soils would maintain native vegetation stability and resiliency to invasive species spread or invasion.

Suspending or deferring livestock grazing following surface disturbance until resource objectives were met would allow native vegetative communities to reestablish to maintain watershed function, stability, and resiliency against invasive species expansion and establishment.

Closing areas where a type of off-highway vehicle use is causing considerable degradation to vegetation until the effects are eliminated would provide protection from further degradation, since the management action has measures to prevent reoccurrence.

ALTERNATIVE A (No Action)

Summary Statement

This alternative projects approximately 75,000 acres of surface disturbance in the short-term and 12,000 acres in the long-term (See Table 1 in *Disturbance Appendix*). Vegetation treatments under this alternative would target ecological sites where plant communities were trending away from those desired for the sites. Impacts from these vegetative treatments would be beneficial over the long-term. Surface disturbance from other resource use activities would affect plant communities depending on timing and effectiveness of reclamation. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity of existing infestations.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 48,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term when communities are reclaimed and/or recovered. Fire suppression would maintain the majority of the planning area in a condition class 2.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 27,000 acres. Vegetative communities would lose site stability until reclamation was complete. Reclamation would occur

on 15,000 acres and 12,000 acres would be affected long-term. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established.

NSO stipulations for oil and gas leasing and development would protect vegetation and prevent soil compaction and vegetation removal.

Allowing prescribed fire in Category B and C Fire Management Categories, which make up the entire planning area, would impact vegetation through disturbance. Usually, invasive species appear in the short-term following fire. Until vegetation was reestablished, road construction and heavy equipment use associated with prescribed fire would impact soil health and vegetative buffers in the short-term. Favorable conditions would allow prescribed fire to accelerate nutrient cycling, sprouting, and forage availability. Very intense burning would decrease sprouting and forage growth and increase the occurrence of invasive species.

Allowing harvest of cottonwood on public lands in the Terry Badlands WSA and only when human safety was a factor or disease or insect infestations were threatening cottonwood stands would improve the health, resiliency, ecological function, and sustainability of cottonwood stands and provide an incidental amount of forest products (e.g., firewood).

Areas of concentrated open off-highway vehicle use (2,400 BLM-administered acres) would result in reduced vegetative health and functionality. Additionally, there would be decreased integrity to vegetation within the open off-highway vehicle areas due to accelerated water erosion.

ALTERNATIVE B

Summary Statement

Alternative B is the most restrictive alternative and results in surface-disturbance estimated on 36,000 acres of BLM administered surface in the short-term and 8,300 acres in the long-term. Vegetation treatments under this alternative would target ecological sites where plant communities were trending away from those desired for that site. Impacts from these vegetative treatments would be beneficial over the long-term when vegetative communities are reclaimed and/or recovered. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity and type of existing infestations.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 18,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term. This alternative would treat or restore the least acres of vegetative communities and habitats (Table 4-23).

Increased limitations to vegetation treatments under this alternative would decrease plant community stability and increase potential wildfire severity and risk of invasive species infestation.

Management of wildfire to meet multiple objectives under alternatives B, C, D, and E, would have a long-term impact on vegetation by accelerating nutrient cycling, sprouting, and forage availability, and promoting restoration or maintenance of native vegetative community distribution and function.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 17,000 acres in the short-term. Vegetative communities would lose site stability until reclamation was complete in the short-term. Approximately 8,300 acres would be disturbed long-term. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established. This alternative would allow the least acres of surface disturbance from resource uses (Table 4-23).

Minimizing surface-disturbing activities would limit the impacts to the relative abundance, distribution, and occurrence of seral stages. These actions would not result in the complete elimination of a plant species, plant community, or seral stage and would decrease the opportunity for invasive species infestations.

Targeted grazing of invasive species using sheep would support desirable plant species. Restricting this activity would allow invasive species to spread and impact native plant communities.

Allowing harvest of cottonwood on public lands only when human safety was a factor or disease or insect infestations were threatening cottonwood stands would improve the health, resiliency, ecological function, and sustainability of cottonwood stands and provide an incidental amount of forest products (e.g., firewood).

Differing from Alternative A, there are no areas of concentrated open off-highway vehicle use within Alternative B and therefore there would not be an impact to vegetation from this activity. When compared to Alternative A, this means 2,400 more acres of desired vegetation would be conserved and protected within Alternative B.

ALTERNATIVE C

Summary Statement

All of the surface disturbing actives proposed under Alternative C are assumed to result in 73,000 acres surface disturbance or in approximately 2.7% of the BLM-administered surface acres in the short-term and 11,000 acres in the long-term. Vegetation treatments under this alternative would target ecological sites where plant communities were trending away from those desired for that site. Impacts from these vegetative treatments would be beneficial over the long-term. Surface disturbance from other resource use activities would affect plant communities depending on timing and effectiveness of reclamation. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity and type of existing infestations.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 47,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term.

Impacts from management of wildfire to meet multiple objectives would be the same as alternative B.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 26,000 acres. Vegetative communities would lose site stability until reclamation was complete in the short-term. Approximately 11,000 acres would be disturbed in the long-term. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established.

Although avoiding or restricting surface-disturbing and disruptive activities or requiring burial of power lines would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages. Burying power lines would create conditions for invasive species infestations. All other activities would require specialized design features.

Allowing surface-disturbing activities in areas of invasive species infestations would increase the potential for weed infestations and expansion, and decrease the vigor of desirable vegetative species.

Using Early Detection Rapid Response for controlling invasive species in publicly accessible areas, riparian areas, and special status species habitat areas would assist in recovering vegetation to its native state.

Prioritizing these areas of treatment would reduce the degree of spread by invasive species in these areas (and other areas) by eliminating or significantly decreasing weed infestations, which would decrease the possibility of invasive species seed dispersal on other lands.

Allowing prescribed fire throughout the entire planning area would impact vegetation through disturbance. Usually, invasive species appear in the short-term following prescribed fire. Until vegetation was reestablished, road construction and heavy equipment use associated with prescribed fire would impact soil health and vegetative buffers in the short-term. Favorable conditions would allow prescribed fire to accelerate nutrient cycling, sprouting, and forage availability. Very intense burning would decrease sprouting and forage growth and increase the occurrence of invasive species.

Allowing limited harvest of cottonwood under alternatives C, D, and E, only to restore the health and resiliency of cottonwood stands or remove hazard trees would ensure that cottonwood trees were protected from further decline, and provide for enhanced recreational experience.

In terms of concentrated open off-highway vehicle use areas, Alternative C results in 640 acres being available for this type of use. This is a 1,700 acre decrease in available acres when compared to alternative A, but a 640 acres increase in available acres when compared to alternative B. In addition, the area of open off-highway vehicle use within Alternative C would result in decreased vegetative health due to accelerated water erosion.

ALTERNATIVE D

Summary Statement

All of the surface disturbing actives proposed under Alternative D are assumed to result in 80,000 acres of surface disturbance or in approximately 2.9% of the BLM-administered surface acres in the short-term and 12,000 acres in the long-term. Vegetation treatments under this alternative would target ecological sites where plant communities were trending away from those desired for that site. Impacts from these vegetative treatments would be beneficial over the long-term. Surface disturbance from other resource use activities would affect plant communities depending on timing and effectiveness of reclamation. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity and type of existing infestations.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 48,106 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term.

Impacts from management of wildfire to meet multiple objectives would be the same as alternative B.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 32,000 acres. Vegetative communities would lose site stability until reclamation was complete in the short-term. Long-term disturbance would be approximately 12,000 acres. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established. This alternative would disturb the most acres from resource uses (Table 4-23).

Allowing surface-disturbing and disruptive activities or requiring burial of power lines would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages. Burying power lines would create desirable conditions for invasive species infestations.

Allowing surface-disturbing activities in areas of invasive species infestations only with approved measures would increase the potential for weed infestations and expansion and decrease the vigor of desirable vegetative species.

Allowing prescribed fire throughout the entire planning area would impact vegetation through disturbance. Usually, invasive species appear in the short-term following prescribed fire. Until vegetation was reestablished, road construction and heavy equipment use associated with prescribed fire would impact soil health and vegetative buffers in the short-term. Favorable conditions would allow prescribed fire to accelerate nutrient cycling, sprouting, and forage availability. Very intense burning would decrease sprouting and forage growth and increase the occurrence of invasive species.

Allowing limited harvest of cottonwood would have the same impacts as alternative C.

Because livestock grazing would impact the vigor and reproduction of palatable species, livestock management actions that enhanced associated characteristics of key plant species would provide habitat for these species.

In terms of concentrated open off-highway vehicle use areas, Alternative D results in 2,000 acres being available for this type of use. This is a 400 acre decrease in available acres when compared to Alternative A, a 2,000 acre increase in available acres when compared to Alternative B, and a 1,400 acre increase in available acres when compared to Alternative C. Therefore in comparison to Alternative A, there would be a decrease in the adverse impacts to vegetation. Conversely there would be an increase in comparison to alternative B and Alternative C for the adverse impacts to vegetation. In addition, in the area of open off-highway vehicle use there would be decreased integrity to vegetation due to accelerated water erosion.

ALTERNATIVE E (Proposed)

Summary Statement

All of the surface disturbing actives proposed under Alternative E are assumed to result in 79,000 acres of surface disturbance or in approximately 2.8% of the BLM-administered surface acres in the short-term and 12,000 acres in the long-term. Vegetation treatments under this alternative would target ecological sites where plant communities were trending away from those desired for that site. Impacts from these vegetative treatments would be beneficial over the long-term. Surface disturbance from other resource use activities would affect plant communities depending on timing and effectiveness of reclamation. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity and type of existing infestations. Adherence to GRSG habitat objectives (Table 2-4) in vegetation management would ensure that projects improve breeding, nesting, brood rearing, and wintering habitat for GRSG and provide a net conservation gain to the species.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 48,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term. This alternative would allow for treating the most acres of native vegetation communities.

Impacts from management of wildfire to meet multiple objectives would be the same as alternative B.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 31,000 acres. Vegetative communities would lose site stability until reclamation was complete in the short-term. Approximately 12,000 acres would be disturbed long-term. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established.

Allowing surface-disturbing and disruptive activities or requiring burial of power lines would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages in the specific project areas. Burying power lines would create desirable conditions for invasive species infestations. Specialized design features would be used to mitigate possible negative impacts.

Allowing surface-disturbing activities in areas of invasive species infestations would increase the potential for weed infestations and expansion and decrease the vigor of desirable vegetative species.

Using Early Detection Rapid Response for controlling invasive species in publicly accessible areas, riparian areas, and special status species habitat areas would assist in recovering vegetation to its native state. Prioritizing these areas of treatment would reduce the degree of spread by invasive species in these areas (and other areas) by eliminating or significantly decreasing weed infestations, which would decrease the possibility of invasive species seed dispersal on other lands.

Allowing prescribed fire throughout the entire planning area would impact vegetation through disturbance. Usually, invasive species appear in the short-term following prescribed fire. Until vegetation was reestablished, road construction and heavy equipment use associated with prescribed fire would impact soil health and vegetative buffers in the short-term. Favorable conditions would allow prescribed fire to accelerate nutrient cycling, sprouting, and forage availability. Very intense burning would decrease sprouting and forage growth and increase the occurrence of invasive species.

Allowing limited harvest of cottonwood would have the same impacts as alternative C.

If allotments which did not meet or make progress toward meeting Standards for Rangeland Health 5 years from assessment determination, livestock grazing would be suspended. This would improve native vegetation communities in the short-term, vegetation would be dominated by older plants, contain a high litter cover, and experience reduced recruitment over the long-term as available niches were occupied.

In terms of concentrated open off-highway vehicle use areas, Alternative D results in zero acres being available for this type of use. This is a 2,400 acre decrease in available acres when compared to Alternative A, equal in comparison to Alternative B, 640 acre decrease in available acres when compared to Alternative C and a 2,000 acre decrease in comparison to Alternative D. Therefore in comparison to Alternative A, C and D, there would be a decrease in the adverse impacts to vegetation.

CUMULATIVE IMPACTS

Historical and ongoing activities within the planning area that have affected, or are currently affecting vegetation communities include energy and mineral development, livestock grazing, on- and off-highway vehicle use, recreation, infrastructure development, fire suppression, fuels management, forestry, urbanization, invasive weed infestations, pollutants, and agriculture; these impacts are expected to continue into the future. The cumulative effects of such activities have directly or indirectly contributed to increased shift of native plant community size, distribution, and risk of invasion or expansion of invasive species. Currently, the BLM is not aware of any other reasonably foreseeable future actions, other than those discussed above.

The BLM's current and future goals for vegetation management are aimed at maintaining and improving plant community health and productivity, minimizing invasive species impacts, and maintaining stable native plant communities according to respective ecological sites. Under all alternatives, the standards for rangeland health would be used to assess departure of vegetation attributes from those expected as described in ecological site descriptions.

Current and future activities have the potential to cumulatively impact vegetation resources within the planning area as demand for resources continues to grow; however, the land pattern in the planning area would prevent anything more than minor impacts from BLM-authorized activities. Fire, roads management, and energy and mineral resource activities would have the greatest potential to contribute to cumulative impacts to the vegetative resource on BLM-administered lands.

In general, Alternative B would restrict the greatest number of surface use authorizations, subsequently protecting more vegetative resources than all other alternatives, and Alternative C would restrict the fewest surface use authorizations and protect the fewest vegetative resources of all alternatives. Alternatives A and D would also restrict surface use authorizations. Typically, there would be fewer restrictions under Alternatives A and D than under Alternative B, but more than those under Alternative C. Alternative D would generally be more restrictive than Alternative A.

Implementation of project stipulations and mitigation measures by the BLM would result in minor cumulative impacts to special status plant populations. Impacts would be caused by ground disturbances created by new road and trail construction; fire and fuels management; energy and mineral activities; forestry activities; livestock grazing; OHVs; and utility, transportation, and communications projects.

Alternative A (No Action)

Management actions on grasslands and shrublands (e.g., prescribed fire, weed treatments, livestock grazing, mechanical treatments, and reseeding) throughout the planning area would impact vegetation composition and structure. Treatments by BLM are proposed on 1.7% of the planning area, therefore the incremental impacts at the planning area scale would be minor for Alternative A.

Alternative B

Proposed treatments would have the potential to affect plant communities by changing the relative abundance of species within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. Cumulative impacts would include those caused by livestock grazing, habitat manipulation, and invasive species. Changing levels of livestock use on BLM-administered lands would potentially cause changes in grazing practices on private land. A reduction of the grazing periods or quantity of livestock permitted on BLM-administered lands would potentially lead to increased or longer durations of use on private lands, which would potentially cause a decline in the ecological condition of these lands and reduce the wildlife habitat quality. Treatments by BLM are proposed on 0.7% of the planning area, therefore the incremental impacts at the planning area scale would be minor although slightly less than Alternative A.

Alternative C

Although avoiding or restricting surface-disturbing and disruptive activities would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages. Treatments by BLM are proposed on 1.7% of the planning area, therefore the incremental impacts at the planning area scale would be minor although slightly greater than Alternative A.

Alternative D

Although avoiding or restricting surface-disturbing and disruptive activities would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages. Treatments by BLM are proposed on 1.7% of the planning area, therefore the incremental impacts at the planning area scale would be minor although slightly greater than Alternatives A.

Alternative E (Proposed)

Although avoiding or restricting surface-disturbing and disruptive activities would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages. Treatments by BLM are proposed on 1.7% of the planning area, therefore the incremental impacts at the planning area scale would be minor although slightly greater than Alternative A.

RIPARIAN AND WETLAND AREAS

Impacts to riparian-wetland areas would occur when something altered the physical, chemical, or biological components of the ecosystem. Actions that contributed to the decline in abundance, distribution, or functionality of riparian-wetland areas would be considered adverse impacts. Conversely, beneficial impacts would result from management actions that maintained or restored riparian-wetland areas.

Direct impacts to riparian-wetland areas would result from the disturbance of vegetation or soils in these communities. Indirect impacts would result from actions in a watershed that caused a change in riparian-wetland functionality (i.e., increased rates of sediment loading or changes in hydrology), a change in water chemistry, or the spread of invasive species.

SUMMARY OF IMPACTS

Impacts to riparian-wetland areas would be caused by surface disturbances primarily associated with mineral resources development, ROWs, and livestock grazing. Impacts from wildlife would be more localized and site-specific than the broad impacts of livestock grazing. Alternative E would result in the fewest adverse impacts to riparian-wetland areas. Management actions under this alternative would result in the smallest amount of surface disturbance and the most restrictions on resource use. Conversely, Alternative A would result in the most adverse impacts to riparian-wetland areas. Management actions under this alternative would result in the greatest amount of surface disturbance and the fewest restrictions on resource use. Alternative C manages riparian-wetland areas more like Alternative E than like Alternative A. Alternative D manages riparian-wetland areas more like Alternative A than like Alternative C. Alternative B manages riparian-wetland areas more like Alternative D than like Alternative A.

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in this impact analysis include the following:

Assumptions

- There would be 2 to 10 riparian and wetland projects constructed for the benefit of riparian-wetland areas each year, disturbing a total of 10 to 100 acres per year.
- There are between 800,000 and 1.3 million acres of riparian-wetland areas in the planning area.
- When data are collected on all the potential riparian and wetland areas, it is assumed that 5 percent of the total streams assessed for riparian-wetland areas would be rated functional-at risk with downward trend, 3 percent of the total streams assessed for riparian-wetland areas would be rated nonfunctional, and 35 percent would be found to be non-riparian.
- Where appropriate actions have been applied following rangeland health assessments, riparian-wetland plant communities are functioning properly or are in the process of achieving PFC.
- Surface disturbances generally increase the potential for accelerated sediment loading to streams.
- Surface disturbances generally increase surface runoff to streams due to an increase in impervious surface, changes in water routing, and loss of vegetation.
- Surface disturbance, vehicle use of roads and trails, livestock and wildlife grazing, and recreational use increase the likelihood of the introduction and spread of invasive species in an area.
- The greater the amount of surface disturbance in a watershed, the greater the probability that excess surface runoff and sediment will enter a stream and contribute to the loss of riparian-wetland functionality.
- Surface runoff to streams generally increases as livestock stocking rates increase. Low stocking rates typically result in no measurable impact to surface runoff, moderate stocking rates typically result in a negligible impact to surface runoff, high stocking rates result in a measurable impact to surface runoff, and consecutive years of high stocking rates have the highest potential for increasing surface runoff to streams.
- Livestock use is typically disproportionately higher in riparian-wetland areas than in upland areas. Improper livestock grazing management can adversely impact riparian-wetland areas throughout the year, but generally there are more impacts in spring and early summer when soils are wet and more

vulnerable to compaction and stream banks are more vulnerable to sloughing. Livestock tend to congregate in these areas during the hot season (mid through late summer). While stocking rates for an allotment or pasture might be low to moderate, the utilization levels in riparian-wetland areas can be high.

- Riparian-wetland areas are managed to meet PFC and the Standards for Rangeland Health. Meeting these standards depends primarily on grazing management. Riparian-wetland areas are evaluated during Land Health Assessments. The BLM assesses riparian-wetland areas using the PFC method. The BLM manages livestock and implements rangeland improvement projects to maintain riparian-wetland areas in PFC or an improving trend that will lead to PFC.
- Livestock numbers are managed on an annual basis based on livestock permittees' operations, available forage, and permitted seasons of use.
- Wildlife can adversely impact riparian-wetland areas, depending on the numbers and types of wildlife and when the use occurs; however, impacts from wildlife are more localized and site specific and are not widespread in the planning area.
- Management actions for soil resources will help minimize soil erosion, and sediment, salt, and nutrient loading in waterbodies.
- Stream channel and land health conditions can degrade quite rapidly. Recovery is often a much slower process. It is generally more efficient to prevent degradation than to recover a degraded system.

Methods

- Riparian-wetland areas were calculated using the best available data from the Montana Gap Analysis Program, the National Wetland Inventory, and the 2009 National Hydrography Dataset.

IMPACTS COMMON TO ALL ALTERNATIVES

Impacts to riparian-wetland areas would be similar among the alternatives, but the magnitude of impacts would vary by alternative.

Management actions under each alternative would result in direct and indirect impacts. Because riparian-wetland areas are limited in the planning area and often the most productive lands, humans, livestock, and wildlife disproportionately impact these areas compared to upland areas. The alternatives would generally avoid or attempt to minimize or mitigate direct adverse impacts to riparian-wetland areas. Impacts from projects or uses that involve riparian-wetland areas could be minimized through the application of BMPs or leasing stipulations. In addition, the BLM would manage riparian-wetland areas to meet PFC and the Standards for Rangeland Health under all alternatives.

Indirect impacts to riparian-wetland areas would occur primarily through sediment delivery from upland areas. While most surface-disturbing activities would not occur in riparian-wetland areas, these areas could experience indirect impacts from soil compaction, loss of vegetative cover, and erosion in upland areas, causing increases in sediment delivery to streams. Higher sediment loading in streams could alter their form and the functionality and resiliency of adjacent riparian-wetland areas. The impact of increased sediment loading would depend on the stream's ability to pass the sediment through the system and on the discharge volume and channel slope gradient of the stream. In lower gradient reaches, deposition would occur and the stream channel would aggrade, possibly becoming braided and shallow. In such cases, the functionality of riparian-wetland areas would change.

All alternatives include actions that restrict surface disturbance, which is generally considered to beneficially impact riparian-wetland areas. For example, withdrawals that close areas to surface-disturbing activities or requirements for construction, operation, monitoring, and reclamation planning before surface-disturbing activities are initiated would, at a minimum, reduce the potential for adverse impacts to riparian-wetland areas from surface-disturbing activities. Conversely, restricting surface-disturbing activities could preclude the long-term benefits that would otherwise be gained through activities that directly benefited resources, such as watershed enhancement projects, aquatic and terrestrial wildlife habitat projects, and riparian-wetland enhancement projects. Table 4-22 shows how management actions related to oil and gas development would

affect acres of riparian-wetland areas maintained (i.e., closed or NSO stipulation), conserved (i.e., CSU stipulation), or at risk of degradation (i.e., open with no restrictions).

Air resources management actions that reduced contributions to climate change and accommodated or mitigated long-term changes in seasonal weather patterns would benefit riparian-wetland areas.

Management actions that directly or indirectly maintained or improved water quality would also maintain or improve riparian-wetland areas by maintaining soil health and the vigor of riparian-wetland vegetation. Surface water impoundments would reduce the amount of water available to natural riparian and wetland plant communities; increase scour of the downstream streambed (Dodds et al, 2004); and change nutrient cycling, timing and magnitude of peak and low flows, sediment load, and riparian vegetation recruitment and succession. The decommissioning of surface water impoundments would reduce these impacts.

Surface-disturbing activities in riparian-wetland areas would cause soil compaction, vegetation removal, and soil disturbance, which would increase surface runoff, sedimentation, and instability of the stream channel and streambanks. The ability of riparian vegetation to dissipate the energy of high water flows, filter sediment, stabilize streambanks, and enhance floodplain functionality would be reduced. The capacity of wetlands to improve water quality, allow groundwater recharge and discharge, filter sediment, retain floodwater, and remove pollutants from water would be reduced (Prichard et al. 1999). Draining of wetlands could increase the magnitude of large flooding events (Poff et al. 1997). Although many of these impacts would be short-term with successful reclamation, success of reclamation activities would probably be low and impacts would be likely to persist (FERC 2004). Changes to surface and subsurface drainage would result in long-term changes in wetland integrity and function if water retention were reduced or eliminated through the disturbance of impermeable layers. Spills from equipment or facilities could contaminate riparian-wetland areas.

**TABLE 4-22.
RIPARIAN-WETLAND AREAS AND ADJACENT AREAS
MAINTAINED, CONSERVED, AND AT RISK OF DEGRADATION
FROM OIL-AND-GAS ASSOCIATED SURFACE DISTURBANCES.**

	Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Resources Maintained	Riparian-Wetland Areas	150,000 acres	150,000 acres	1,000 acres	1,000 acres	150,000 acres
	Adjacent Areas[1]	15,000 acres	15,000 acres	15,000 acres	15,000 acres	15,000 acres
Resources Conserved	Riparian-Wetland Areas	0 acres	0 acres	150,000 acres	150,000 acres	0 acres
	Adjacent Areas[1]	0 acres	1,200,000 acres	0 acres	0 acres	1,200,000 acres
Resources at Risk	Riparian-Wetland Areas	0 acres	0 acres	0 acres	0 acres	0 acres
	Adjacent Areas[1]	1,200,000 acres	0 acres	1,200,000 acres	1,200,000 acres	0 acres

[1]Adjacent areas are those within 300 feet of the boundary of identified riparian-wetland areas

Riparian-wetland enhancement projects would beneficially impact riparian-wetland areas by improving their functionality and resiliency. Enhancement projects could include plantings, livestock and/or wildlife exclosures, structural modifications to improve riparian-wetland hydrology, or other projects that enhance riparian-wetland vegetation, soils, or hydrology.

Invasive species such as tamarisk, Russian olive, Russian knapweed, or leafy spurge could impact riparian-wetland areas by dominating and replacing native vegetation like sedges, cottonwoods, and willows. Invasive species are particularly undesirable in riparian-wetland areas because they lack the necessary root mass to adequately bind soil and dissipate the energy associated with high flow events. Invasive species indirectly impact riparian-wetland areas by reducing vegetative cover of upland areas, which increases erosion and sediment delivery to riparian-wetland areas.

Prescribed fire and managed wildfire in the planning area could impact riparian-wetland areas in the short-term through the removal of riparian-wetland vegetation or indirectly by removing vegetation in adjacent upland areas, exposing soils to water and wind erosion, and generating sediment. Over the long-term, if vegetative recovery is successful, fires of the appropriate intensity can beneficially impact riparian-wetland areas by recharging water tables, increasing the amount of vegetative cover, and reducing erosion. The extent of using prescribed fire or managing wildfire to restore fire-adapted ecosystems or reduce hazardous fuels varies by alternative.

Management of forest product sales would result in vegetation removal, surface disturbance, road construction, and soil compaction in upland areas, which would increase erosion, surface runoff, and sedimentation. Post-fire salvage logging would delay natural watershed recovery, particularly in riparian areas (Karr et al. 2004). BMPs to reduce adverse impacts to riparian-wetland areas and compliance with the Streamside Management Zone Law would reduce impacts to riparian-wetland areas under all alternatives and maintain PFC or an improving trend leading to PFC.

Riparian-wetland areas typically experience the most adverse impacts from grazing during the hot summer season (June 15 through September 15) when livestock tend to loiter and select these areas for the higher-quality forage, open water, and thermal cover that they provide. If improperly managed, livestock could directly impact bank stability in lotic systems, affect water quality, limit the growth and vigor of riparian-wetland vegetation, and create hummocking leading to soil compaction. Riparian-wetland soils are sensitive to hummocking and compaction, which decreases water infiltration rates and water-holding capacity. Heavy use of riparian-wetland areas would suppress the reproduction of riparian-wetland obligate species and could lead to a shift toward a more grazing-resistant plant community composed of annual species such as Kentucky bluegrass. Annual species lack the root masses capable of withstanding high flow events, which would lead to bank shearing, and either widening of the channel or headcutting. As these alterations to channel morphology occurred, riparian-wetland areas would lose their ability to hold moisture, leading to increases in surface runoff and contributing to excessive sedimentation. Grazing plans and systems that properly managed timing, intensity, frequency, grazing duration, livestock behavior, and foraging preferences; and range improvements that reduced utilization in riparian and wetland areas would manage vegetation composition, cover, and vigor to maintain or achieve Standards for Rangeland Health and PFC in riparian-wetland areas.

Bore crossing or horizontal directional drilling would avoid contact with large portions of riparian and wetland areas. Slight impacts to vegetation from heavy equipment activity on the outer edge of riparian buffers would occur in the short-term. Surface discharge of produced water may be permitted by the Montana Department of Environmental Quality through the Montana Pollutant Discharge Elimination System. Produced water would represent a new water source that supplemented existing water flows. Increased water availability could have a beneficial impact on riparian-wetland vegetation by expanding existing or creating new riparian-wetland areas. The chemistry of produced water could change not only the vegetative community but also the soil chemistry of riparian-wetland areas. When production operations cease, these newly created or expanded riparian-wetland areas would no longer have the steady source of water necessary to maintain riparian-wetland obligate plant species. The loss of riparian-wetland hydrology, compounded by modifications to soil chemistry, would create ecological conditions that are often difficult to reclaim to the pre-development plant community. Newly created riparian-wetland areas would ultimately provide only a temporary beneficial impact. Conversely, increasing water flow into existing riparian-wetland areas could result in an adverse impact through increased erosion, loss of bank stability, downcutting of stream channels, and increased sedimentation and deposition, leading to widening and braiding of stream channels. Impacts from the discharge of produced water are most often adverse to riparian-wetland areas due to increased sedimentation, salinity, concentration of dissolved compounds, and water temperature.

Impacts to riparian-wetland areas from BLM-authorized oil and gas development within the proposed Carter MLP area will be the same as those impacts that occur outside the proposed MLP area.

The BLM manages aquatic and riparian-wetland habitat for several special status species (e.g., piping plover, interior least tern, pallid sturgeon). Management of habitats crucial for these special status species would

generally involve restricting activities in the vicinity of riparian-wetland areas. The restrictions associated with these special status species would result in beneficial impacts to riparian-wetland areas that are within the vicinity of the buffer zones for these species.

OHV impacts would be localized in intensively used areas. Vehicle fords would cause localized erosion, sedimentation, and degradation of streambanks in riparian-wetland areas. Weed invasion would lead to accelerated erosion and changes in watershed hydrology. Sheet or rill erosion would be the most common on poorly designed or maintained roads and trails during periods of high moisture and would transport sediment from upland areas to riparian-wetland areas; these impacts would increase with increasing OHV use. Impacts would be reduced and localized in areas in which OHVs would be limited to designation routes. In general, these impacts are estimated to occur in less than 1 percent of a watershed (BLM and USFS 2001).

Surface-disturbing activities associated with ROWs expose soils to increased erosion and increased rates and volumes of surface runoff over the short and long-terms. Increases in surface disturbance related to lands actions could be expected to result in a proportionate increase in indirect adverse impacts to riparian-wetland areas.

ALTERNATIVE A (No Action)

Summary Statement

Riparian-wetland area management under Alternative A would consist of managing the 76,000 acres of riparian-wetland areas on BLM-administered surface to meet PFC and requiring an NSO stipulation for oil and gas development on 150,000 acres of riparian-wetland areas (Table 4-22). However, maintaining adequate vegetated buffers adjacent to riparian-wetland areas would not be required, which would increase the risk of adverse impacts to riparian-wetland areas from surface-disturbing activities in adjacent upland areas. The projected number of wells and associated surface disturbance under Alternative A would result in an estimated disturbance over the planning period of 55 acres of disturbance in riparian-wetland areas and 870 acres of disturbance in areas adjacent to (i.e., within 300 feet of) riparian-wetland areas (Table 4-23). Site-specific management actions such as fencing, deferred use, or resting would be implemented to maintain or make progress towards PFC. Alternative A range improvement projects would result in more adverse impacts to riparian-wetland areas compared to the other alternatives.

**TABLE 4-23.
PROJECTED BLM-ADMINISTERED ACRES
OF RIPARIAN-WETLAND AREAS DISTURBED
DURING THE PLANNING PERIOD BY
OIL-AND-GAS ASSOCIATED ACTIVITIES**

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Riparian-Wetland Areas	55 acres	0 acres	91 acres	91 acres	55 acres
Adjacent Areas[1]	870 acres	370 acres	870 acres	870 acres	870 acres

[1] Adjacent areas are those within 300 feet of the boundary of identified riparian-wetland areas.

Resources

Although prohibiting surface-disturbing activities due to a variety of resource concerns would prevent short-term adverse impacts to riparian-wetland areas, it would also prevent some long-term beneficial impacts. Management actions under Alternative A that prohibited surface-disturbing activities would prevent the completion of 87 acres of riparian-wetland enhancement projects, 87 acres of watershed enhancement projects, and 87 acres of aquatic habitat enhancement projects (See *Disturbance Appendix*). Preventing the completion of these resource projects would prevent short-term adverse impacts such as accelerated sediment delivery to riparian-wetland areas, decreased water quality, and decreased ability of riparian-wetland areas to dissipate the energy of high flow events. However, it would also preclude the long-term benefits of such projects (e.g., improved fish passage; improved composition, density, and structure of vegetative communities; increased watershed health and function; etc.).

Alternative A would conserve riparian-wetland areas because it would require a CSU stipulation for oil and gas development on slopes 30% or greater and would limit or avoid other surface-disturbing activities on steep slopes and highly erodible soils. To the extent that surface-disturbing activities on these areas were limited or avoided, excessive sedimentation of riparian-wetland areas would be limited or avoided.

Alternative A would conserve riparian-wetland areas because it would allow surface-disturbing activities on 100-year floodplains and on waterbodies, provided that the activity would meet the requirements of Executive Order 11988 and federal and state water quality requirements. Oil and gas development would not be allowed or would be allowed with an NSO stipulation on 82,000 acres of 100-year floodplains and 40,000 acres of waterbodies, which would help maintain adjacent riparian-wetland areas.

Alternative A would allow surface-disturbing activities in areas of invasive species infestations, which would be likely to spread invasive species. Impacts to riparian-wetland areas based on invasive species infestations are addressed above under *Impacts Common to All Alternatives*.

Alternative A would allow oil and gas development with an NSO stipulation within 0.25 miles of wetlands identified as piping plover or interior least tern habitat, which would maintain riparian-wetland areas. Additionally, Alternative A management actions that prohibited surface-disturbing activities in order to prevent impacts to other wildlife and special status species habitat would help prevent the adverse impacts associated with these activities to riparian-wetland areas.

Resource Uses

Under Alternative A, approximately 710 surface water impoundments would be constructed, disturbing 710 acres (See *Disturbance Appendix*). Impacts to riparian-wetland areas based on construction of new surface water impoundments are addressed above under *Impacts Common to All Alternatives*.

Under Alternative A, livestock grazing and associated surface-disturbing activities would be allowed with minimal restrictions. Two spring developments would be constructed per year and would be fenced to reduce the impacts of livestock concentration. Alternative A would avoid the placement of livestock water developments in riparian-wetland areas within the area administered under the Big Dry RMP, which would reduce vegetation removal, soil compaction, and sediment production from concentrated livestock grazing. However, it would allow livestock water developments in riparian-wetland areas within the area administered under the Powder River RMP, which would increase soil compaction, reduce water quality, and reduce the vigor and cover of riparian-wetland vegetation.

Alternative A would allow wood product sales for posts and poles, Christmas trees, and firewood, and sales for salvage harvest of ponderosa pine affected by insects, fire, or other natural causes. Impacts to riparian-wetland areas based on management of forest product sales are addressed above under *Impacts Common to All Alternatives*. Alternative A would manage forestlands with 10% of more canopy cover per acre for the enhancement of resources, which would have a beneficial impact on riparian-wetland areas.

While Alternative A requires an NSO stipulation for surface-disturbing activities associated with oil and gas development in riparian-wetland areas, these activities, including well pad, pipeline, and access road construction, in upland areas could increase sediment delivery to riparian-wetlands. Linear features (e.g., pipelines and roads) would result in adverse impacts to riparian-wetland areas by impacting bank stability and directly routing water and sediment to these areas. The loss of vegetation, compounded with soil compaction related to minerals development, would lead to increased runoff and sedimentation in riparian-wetland areas. The magnitude and duration of the impacts of linear underground facilities that crossed riparian-wetland areas would vary depending on the method used. Open-cut wet crossings would increase erosion and sedimentation and impact stream morphology, which would affect the ability of riparian areas to withstand high flow events. Isolated crossing methods would cause impacts similar to those caused by open-cut wet crossings, but with less severity and duration. The increases in sedimentation would be limited to the installation and removal of dam or flume structures (Lévesque 2007). Vegetation removal would be short-term, and re-vegetation of riparian and wetland areas would occur more quickly. Wells, pipelines, and facilities situated adjacent to riparian-wetland

areas could contribute produced water of varying quality or hydrocarbons directly to the riparian-wetland area in the event of a spill. This would contaminate riparian-wetland soils and result in adverse impacts to vegetation and water quality.

Most of the impacts from mineral development, including oil and gas development, would be temporary during the life of the operation. Upon completion of operations, all existing disturbances would be reclaimed. However, in the short-term, mineral development activities would increase the potential for riparian-wetland area degradation.

ROWs result in surface disturbance, with the potential for adverse impacts to riparian-wetland areas. Alternative A allows ROWs on more acres than under any other alternative. As a result, Alternative A has the potential to result in the most adverse impacts from ROWs to riparian-wetland areas.

ALTERNATIVE B

Summary Statement

Riparian-wetland area management under Alternative B would reduce the risk of adverse impacts to riparian-wetland areas compared to Alternative A. Alternative B would manage the 76,000 acres of riparian-wetland areas on BLM-administered surface to meet PFC. Alternative B prohibits surface disturbing activities and oil and gas development within riparian-wetland areas. Closing riparian-wetland areas to oil and gas development would maintain 150,000 acres of riparian-wetland areas on BLM-administered mineral estate (Table 4-22) and result in an estimated disturbance over the planning period of 0 acres of disturbance in riparian-wetland areas. In addition, Alternative B would establish a 300-foot buffer on riparian-wetland areas. Surface-disturbing activities within this buffer would be allowed with mitigation measures to maintain or improve the functionality and resiliency of the associated riparian-wetland area, and oil and gas development would be offered with a CSU stipulation, which would conserve riparian-wetland areas. This CSU stipulation would conserve an additional 1,200,000 acres adjacent to riparian-wetland areas (Table 4-22), which would reduce impacts to riparian-wetland areas. The projected number of wells and associated surface disturbance under Alternative B would result in an estimated disturbance over the planning period of 370 acres of disturbance adjacent to (i.e., within 300 feet of) riparian-wetland areas. New spring developments and livestock water developments would not be allowed in riparian-wetland areas.

Resources

Management actions under Alternative B that prohibited surface-disturbing activities would prevent the completion of 1,300 acres of riparian-wetland enhancement projects, 1,300 acres of watershed enhancement projects, and 1,300 acres of aquatic habitat enhancement projects (See *Disturbance Appendix*). Alternative B would substantially reduce the number of resource improvement projects benefiting riparian-wetland areas in the long-term.

Alternative B would prevent or mitigate soil erosion and would maintain riparian-wetland areas by limiting sediment production and delivery caused by surface-disturbing activities. Alternative B would prohibit surface-disturbing activities on sensitive soils, badlands, and rock outcrop and would require an NSO stipulation for oil and gas development in these areas. Soils management actions under Alternative B would result in moderately more beneficial impacts to riparian-wetland areas than under Alternative A.

Alternative B would maintain riparian-wetland areas because it would prohibit surface-disturbing activities that did not benefit the functionality of 100-year floodplains or waterbodies and would allow oil and gas development with an NSO stipulation in these areas. Closures and NSO stipulations would maintain 97,000 acres of 100-year floodplains and 40,000 acres of waterbodies, which would help maintain adjacent riparian-wetland areas. Water resources actions under Alternative B would result in moderately more beneficial impacts to riparian-wetland areas than under Alternative A.

Alternative B would prohibit surface-disturbing activities in areas of invasive species infestations. Alternative B would better limit the introduction and spread of invasive species and be more likely to prevent their adverse impacts on riparian-wetland areas than Alternative A.

Management actions under Alternative B designed to maintain wildlife and special status species habitat limit substantially more surface disturbance than Alternative A in riparian-wetland areas for piping plover, interior least tern, and pallid sturgeon. Additionally, surface-disturbing activities are prohibited within Bighorn sheep habitat, crucial big game winter range, and black-tailed prairie dog habitat, which reduces surface disturbance substantially compared to Alternative A. Less surface disturbance would mean fewer adverse impacts to soil, vegetation, and water quality in riparian-wetland areas.

Resource Uses

Alternative B would prohibit new surface water impoundments, which would prevent adverse impacts and beneficially impact riparian-wetland areas compared to Alternative A.

Alternative B forest management would provide more moderate restrictions on forest product sales than Alternative A and would result in indirect beneficial impacts to riparian-wetland areas. Alternative B would allow sales for salvage harvest of ponderosa pine affected by insects but not for any other forest products. The reduction in surface disturbance under Alternative B would likely result in fewer adverse impacts to riparian-wetland areas than under Alternative A.

Management of surface-disturbing activities associated with livestock grazing would be more restrictive under Alternative B than Alternative A and would beneficially impact riparian-wetland areas. New spring developments in riparian-wetland areas would be prohibited under Alternative B. Alternative B would also prohibit the placement of livestock water developments in riparian-wetland areas, which would reduce vegetation removal, soil compaction, and sediment production from concentrated livestock grazing.

Alternative B would open substantially less acreage for ROWs than Alternative A and manage more area as ROW avoidance and exclusion areas. The reduction in surface disturbance under Alternative B would likely result in fewer indirect adverse impacts to riparian-wetland areas than under Alternative A.

ALTERNATIVE C

Summary Statement

Alternative C would manage the 76,000 acres of riparian-wetland areas on BLM-administered surface to meet PFC. Alternative C manages riparian-wetland areas with moderate restrictions on surface-disturbing activities, which would conserve riparian-wetland areas. Surface-disturbing activities and oil and gas development would only be allowed with mitigation measures or a CSU stipulation to ensure that PFC would be maintained or progress would continue to be made toward PFC in riparian-wetland areas. This CSU stipulation would conserve 150,000 acres of riparian-wetland areas, and non-discretionary closures would maintain an additional 1,000 acres (Table 4-22). The projected number of wells and associated surface disturbance under Alternative C would result in an estimated disturbance over the planning period of 91 acres of disturbance in riparian-wetland areas and 870 acres of disturbance in areas adjacent to (i.e., within 300 feet of) riparian-wetland areas (Table 4-23). New spring developments would not be allowed in riparian-wetland areas, and new livestock water developments would avoid areas adjacent to perennial and intermittent streams, which would avoid many riparian-wetland areas. Riparian-wetland area management under Alternative C would reduce the risk of adverse impacts to riparian-wetland areas less than under Alternative B but slightly more than under Alternative A.

Resources

Management actions under Alternative C that prohibited surface-disturbing activities would prevent the completion of 120 acres of riparian-wetland enhancement projects, 120 acres of watershed enhancement

projects, and 120 acres of aquatic habitat enhancement projects (See *Disturbance Appendix*). Alternative C would slightly reduce the number of resource improvement projects compared to Alternative A, but would substantially increase them compared to Alternative B.

Alternative C would avoid surface-disturbing activities on sensitive soils unless the activity could be designed to limit soil erosion, soil compaction, and surface runoff, which would conserve riparian-wetland areas. Surface-disturbing activities would be allowed on badlands and rock outcrop with mitigation measures to maintain or improve the stability of these areas, which would maintain riparian-wetland areas. Oil and gas development would be allowed with a CSU stipulation on sensitive soils, badlands, and rock outcrop, which would conserve riparian-wetland areas. Impacts from soils management actions to riparian-wetland areas under Alternative C would be slightly less beneficial than under Alternative B but slightly more beneficial than under Alternative A.

Alternative C would allow surface-disturbing activities on 100-year floodplains and waterbodies with mitigation measures to minimize impacts, which would conserve riparian-wetland areas. Alternative C would allow oil and gas development in these areas with a CSU stipulation, which would conserve riparian-wetland areas. This stipulation would conserve 96,000 acres of 100-year floodplains and 39,000 acres of waterbodies, while non-discretionary closures would maintain an additional 840 acres of 100-year floodplains and 730 acres of waterbodies, which would help conserve or maintain adjacent riparian-wetland areas. Impacts to riparian-wetland areas under Alternative C would be moderately less beneficial than under Alternative B but slightly more beneficial than under Alternative A.

Alternative C would allow surface-disturbing activities in areas of invasive species infestations with mitigation measures to reduce the spread of invasive species infestations, which would reduce impacts to riparian-wetland areas. Impacts from invasive species management actions to riparian-wetland areas under Alternative C would be slightly more adverse than under Alternative B but moderately more beneficial than under Alternative A.

Alternative C management actions designed to protect wildlife and special status species habitat from the impacts of surface-disturbing activities would prevent the adverse impacts to riparian-wetland areas associated with these activities. Alternative C limits substantially more surface disturbance than Alternative A but substantially less than Alternative B. Less surface disturbance would mean fewer adverse impacts to soil, vegetation, and water quality in riparian-wetland areas.

Resource Uses

Alternative C would allow new surface water impoundments with mitigation measures to maintain the natural flow regime and watershed functionality. Approximately 530 surface water impoundments would be constructed, disturbing 530 acres (See *Disturbance Appendix*). Impacts from surface water impoundments to riparian-wetland areas under Alternative C would be similar to those under Alternative B and substantially more beneficial than those under Alternative A.

Alternative C would manage forestlands for forest health and for a diversity of forest products. Indirect impacts to riparian-wetland areas under Alternative C would be similar to those under Alternative A but slightly to moderately more adverse than under Alternative B.

Alternative C livestock grazing management would have a substantially more beneficial impact to riparian-wetland areas than Alternative A but a slightly less beneficial impact than Alternative B. New spring developments would be prohibited in riparian-wetland areas. Alternative C would prohibit the placement of livestock water developments in riparian-wetland areas unless they would benefit the resource, which would have a beneficial impact to riparian-wetland areas.

While Alternative C requires a CSU stipulation for surface-disturbing activities associated with oil and gas development in riparian-wetland areas, these activities, including well pad, pipeline, and access road construction, in upland areas could increase sediment delivery to riparian-wetlands. Linear features (e.g., pipelines and roads) would result in adverse impacts to riparian-wetland areas by impacting bank stability and

directly routing water and sediment to these areas. The loss of vegetation, compounded with soil compaction related to minerals development, would lead to increased runoff and sedimentation in riparian-wetland areas. The magnitude and duration of the impacts of linear underground facilities that crossed riparian-wetland areas would vary depending on the method used. Open-cut wet crossings would increase erosion and sedimentation and impact stream morphology, which would affect the ability of riparian areas to withstand high flow events. Isolated crossing methods would cause impacts similar to those caused by open-cut wet crossings, but with less severity and duration. The increases in sedimentation would be limited to the installation and removal of dam or flume structures (Lévesque 2007). Vegetation removal would be short-term, and re-vegetation of riparian and wetland areas would occur more quickly. Wells, pipelines, and facilities situated adjacent to riparian-wetland areas could contribute produced water of varying quality or hydrocarbons directly to the riparian-wetland area in the event of a spill. This would contaminate riparian-wetland soils and result in adverse impacts to vegetation and water quality.

Most of the impacts from mineral development, including oil and gas development, would be temporary during the life of the operation. Upon completion of operations, all existing disturbances would be reclaimed. However, in the short-term, mineral development activities would increase the potential for riparian-wetland area degradation.

Alternative C would open substantially less acreage for ROWs than Alternative A and would manage more area as ROW avoidance and exclusion areas. The reduction in ROW surface disturbance under Alternative C would likely result in fewer adverse impacts to riparian-wetland areas than Alternative A but more adverse impacts than under Alternative B.

ALTERNATIVE D

Summary Statement

Riparian-wetland area management under Alternative D would result in a risk of adverse impacts similar to that under Alternative C, slightly smaller than that under Alternative A, and moderately greater than that under Alternative B. Alternative D would manage the 76,000 acres of riparian-wetland areas on BLM-administered surface to meet PFC. Riparian-wetland area management under Alternative D would be the same as under Alternative C, with the exception that new spring developments would be allowed in riparian-wetland areas with mitigation measures.

Resources

Management actions under Alternative D that prohibited surface-disturbing activities would have similar impacts as under Alternative A in regards to resource improvement projects and their long-term benefits to riparian-wetland areas.

Alternative D would allow surface-disturbing activities on sensitive soils, badlands, and rock outcrop with mitigation measures to maintain or improve the stability of the site, which would maintain riparian-wetland areas. Oil and gas development would be allowed with a CSU stipulation, which would conserve riparian-wetland areas. Impacts to riparian-wetland areas under Alternative D would be more beneficial than under Alternatives A or C and similar to those under Alternative B.

Water resources management actions under Alternative D would be similar to those under Alternative C and would result in similar impacts to riparian-wetland areas.

Surface-disturbing activities in areas of invasive species infestations would be managed the same under Alternative D as under Alternative C. Impacts to riparian-wetland areas under Alternative D would be slightly more adverse than under Alternative B but moderately more beneficial than under Alternative A.

Alternative D would be similar to Alternative C in the amount of surface disturbance prevented by wildlife management actions, except that Alternative D would prevent less surface disturbance with regards to black-tailed prairie dog colonies, greater sage-grouse general habitat areas, and greater sage-grouse priority areas.

Alternative D would limit substantially more surface disturbance than Alternative A but substantially less than Alternative B. Less surface disturbance would mean fewer indirect adverse impacts to soil, vegetation, and water quality in riparian-wetland areas.

Resource Uses

Alternative D would allow new surface water impoundments with mitigation measures to maintain the natural flow regime and watershed functionality. Approximately 710 surface water impoundments would be constructed, disturbing 710 acres (See *Disturbance Appendix*). Impacts to riparian-wetland areas under Alternative D would be similar to those under Alternatives B and C and substantially more beneficial than those under Alternative A.

Alternative D would manage forestlands for forest health and for a diversity of forest products. Impacts to riparian-wetland areas under Alternative D would be the same as those under Alternative C, similar to those under Alternative A but slightly to moderately more adverse than those under Alternative B.

Alternative D livestock grazing management actions would be similar to those under Alternative C, with the exception that new spring developments would be allowed with mitigation measures. Impacts to riparian-wetland areas from surface-disturbing activities associated with livestock grazing under Alternative D would be similar to those under Alternative C. Alternative D livestock grazing management would have a substantially more beneficial impact to riparian-wetland areas than Alternative A but a slightly less beneficial impact than Alternative B.

While Alternative D requires a CSU stipulation for surface-disturbing activities associated with oil and gas development in riparian-wetland areas, these activities, including well pad, pipeline, and access road construction, in upland areas could increase sediment delivery to riparian-wetlands. Linear features (e.g., pipelines and roads) would result in adverse impacts to riparian-wetland areas by impacting bank stability and directly routing water and sediment to these areas. The loss of vegetation, compounded with soil compaction related to minerals development, would lead to increased runoff and sedimentation in riparian-wetland areas.

The magnitude and duration of the impacts of linear underground facilities that crossed riparian-wetland areas would vary depending on the method used. Open-cut wet crossings would increase erosion and sedimentation and impact stream morphology, which would affect the ability of riparian areas to withstand high flow events. Isolated crossing methods would cause impacts similar to those caused by open-cut wet crossings, but with less severity and duration. The increases in sedimentation would be limited to the installation and removal of dam or flume structures (Lévesque 2007). Vegetation removal would be short-term, and re-vegetation of riparian and wetland areas would occur more quickly. Wells, pipelines, and facilities situated adjacent to riparian-wetland areas could contribute produced water of varying quality or hydrocarbons directly to the riparian-wetland area in the event of a spill. This would contaminate riparian-wetland soils and result in adverse impacts to vegetation and water quality.

Most of the impacts from mineral development, including oil and gas development, would be temporary during the life of the operation. Upon completion of operations, all existing disturbances would be reclaimed. However, in the short-term, mineral development activities would increase the potential for riparian-wetland area degradation.

Alternative D would open substantially less acreage for ROWs than Alternative A and manage more area as ROW avoidance and exclusion areas. The reduction in surface disturbance under Alternative D would likely result in fewer adverse impacts to riparian-wetland areas than Alternative A but more adverse impacts than Alternatives B or C.

ALTERNATIVE E (Proposed)

Summary Statement

Riparian-wetland area management under Alternative E would result in a risk of adverse impacts similar to that under Alternative B and smaller than that under Alternatives A, C, or D. Alternative E would manage the 76,000 acres of riparian-wetland areas on BLM-administered surface to meet PFC. Surface-disturbing activities would only be allowed with mitigation measures to ensure that PFC would be maintained or progress would continue to be made toward PFC in riparian-wetland areas, and oil and gas development would be allowed with an NSO stipulation, which would maintain riparian-wetland areas. This NSO stipulation would maintain 150,000 acres of riparian-wetland areas (Table 4-22). In addition, Alternative E would establish a 300-foot buffer on riparian-wetland areas. Surface-disturbing activities within this buffer would be allowed with mitigation measures to maintain or exceed the functionality and resiliency of the associated riparian-wetland area, and oil and gas development would be offered with a CSU stipulation, which would conserve riparian-wetland areas. This CSU stipulation would conserve an additional 1,200,000 acres adjacent to riparian-wetland areas (Table 4-22), which would reduce impacts to riparian-wetland areas. The projected number of wells and associated surface disturbance under Alternative E would result in an estimated disturbance over the planning period of 55 acres of disturbance in riparian-wetland areas and 870 acres of disturbance in areas adjacent to (i.e., within 300 feet of) riparian-wetland areas (Table 4-23). New spring developments would be allowed in riparian-wetland areas with mitigation measures, and new livestock water developments would be located to maintain riparian-wetland areas. Riparian-wetland area management under Alternative E would be moderately more beneficial than under Alternatives B, C, and D and substantially more beneficial than under Alternative A.

Resources

Management actions under Alternative E that prohibited surface-disturbing activities would have similar impacts as under Alternatives A and C in regards to resource improvement projects and their long-term benefits to riparian-wetland areas.

Alternative E would allow surface-disturbing activities on sensitive soils, badlands, and rock outcrop with mitigation measures to maintain or improve the stability of the site, which would result in beneficial impacts to riparian-wetland areas. Oil and gas development would be allowed with an NSO stipulation on badlands and rock outcrop and a CSU stipulation on sensitive soils, which would maintain or conserve riparian-wetland areas. Impacts to riparian-wetland areas under Alternative E would be slightly more beneficial than those under Alternatives B, C, or D, and moderately more beneficial than those under Alternative A.

Alternative E would allow surface-disturbing activities in 100-year floodplains and on waterbodies with mitigation measures, which would conserve riparian-wetland areas. Alternative E would offer oil and gas leasing and development in these areas with an NSO stipulation, which would maintain riparian-wetland areas. This stipulation along with non-discretionary closures would maintain 97,000 acres of 100-year floodplains and 40,000 acres of waterbodies, which would help maintain adjacent riparian-wetland areas. Impacts to riparian-wetland areas under Alternative E would be slightly less beneficial than those under Alternative B but more beneficial than those under Alternatives A, C, or D.

Surface-disturbing activities in areas of invasive species infestations are managed the same under Alternative E as under Alternatives C and D. Impacts to riparian-wetland areas under Alternative E would be slightly more adverse than those under Alternative B but moderately more beneficial than those under Alternative A.

Alternative E management actions designed to protect wildlife and special status species habitat from the impacts of surface-disturbing activities would have impacts similar to those under Alternative D.

Resource Uses

Alternative E would allow new surface water impoundments with mitigation measures. Approximately 710 surface water impoundments would be constructed, disturbing 710 acres (See *Disturbance Appendix*). Impacts

to riparian-wetland areas under Alternative E would be similar to those under Alternatives B, C and D and substantially more beneficial than those under Alternative A.

Alternative E would manage forestlands for forest health and for a diversity of forest products. Impacts to riparian-wetland areas under Alternative E would be the same as those under Alternatives C and D, similar to those under Alternative A, but slightly to moderately more adverse than under Alternative B.

Alternative E livestock grazing management actions would be the same as those under Alternative C, with the exception that new spring developments would be allowed with mitigation measures and new livestock water developments would be allowed within 0.25 miles of riparian-wetland areas with mitigation measures. Impacts to riparian-wetland areas from surface-disturbing activities associated with livestock grazing management under Alternative E would be similar to those under Alternatives C and D. Alternative E livestock grazing management would have a substantially more beneficial impact to riparian-wetland areas than Alternative A but a slightly less beneficial impact than Alternative B.

Alternative E would open slightly more acreage for ROWs than Alternative A and manage substantially more area as ROW avoidance areas. Surface disturbance under Alternative E would likely result in fewer adverse impacts to riparian-wetland areas than Alternative A, slightly more adverse impacts than Alternatives C or D, and substantially more adverse impacts than Alternative B.

CUMULATIVE IMPACTS

From the 1860s to the 1890s, the military brought large numbers of domesticated animals (such as horses, mules, sheep, and cattle) to eastern Montana. This introduction contributed to heavy vegetation use, which affected riparian and wetland areas with accelerated erosion and sedimentation. As homesteaders settled during the late 19th century and early 20th century, additional surface disturbances (such as mining, agriculture, and introductions of invasive species) resulted in compaction, accelerated erosion, sedimentation, and altered vegetation competition in riparian and wetland areas. Although homesteaders were required to farm a portion of the land, it was not always suited to intensive agricultural use, and this practice, combined with uncontrolled grazing, took its toll on the native vegetation. To this day, many of the same surface disturbances continue to accelerate erosion and sedimentation and continue to impact riparian and wetland vegetative buffers, streambanks, and channels.

Prior to the homesteading days, bison roamed the area in large herds and consumed vegetation in the uplands and riparian and wetland areas, affecting vegetative buffers and trampled streambanks. Without vegetative cover, winds removed topsoil and floods and runoff removed soil, causing erosion and sedimentation within riparian and wetland areas.

Droughts in the early 20th century, in combination with cropland development, worsened wind erosion of agricultural lands. At this time, under the authority of the Bankhead-Jones Act, the federal government purchased areas of abandoned homesteads and rangelands that were sub-marginal in size and condition and operated these lands under conservation practices and management. Crested wheatgrass was planted in most of these areas while others returned the plowed ground to native vegetation.

Invasive vegetation species and altered upland vegetation became a problem in areas of disturbed soils. Invasive vegetation species changed the vegetative component of riparian and wetland areas throughout the 20th century and remain a problem today. Invasive vegetation species (particularly leafy spurge) outcompete desired riparian and wetland vegetation, decreasing soil moisture and increasing erosion and sedimentation. The Conservation Reserve Program, which began in 1985, was another effort to turn marginal, privately owned cropland back into grassland. Most lands enrolled in the Conservation Reserve Program were planted with crested wheatgrass or other introduced grasses, further altering riparian and wetland vegetation types.

OHV use and road and interstate development in the 20th century contributed to vegetation removal, increasing compaction, erosion, and sedimentation in riparian and wetland areas across the planning area. Increased vehicle use on unimproved roads (particularly during wet conditions) has caused rutting, erosive channeling,

and braided or parallel roads and trails. Fire suppression and the introduction of nonnative vegetation has altered natural fire regimes and created hazardous fuels. Vegetation recovery takes several years and depends on many environmental conditions, including soil type and precipitation. Compaction and excessive vegetation removal impact the hydrology of a watershed by significantly reducing infiltration and increasing surface runoff. Faster runoff rates and increased runoff amounts result in the rapid delivery of water to stream channels, causing increased channel degradation and sedimentation.

Ongoing disturbance activities would impact riparian and wetland areas and associated vegetation buffers by increasing erosion and sedimentation. Such activities would potentially include fire suppression, excessive livestock grazing, vegetation removal, weed invasions, mineral exploration and development, OHV use, and nearby agriculture. However, activities that affected riparian and wetland areas would meet land health standards and would not cause effects to lower ratings and trends on individual reaches. Activities occurring adjacent to BLM-administered lands would potentially contribute to the functioning condition of riparian and wetland areas and enable the improvement of nonfunctional and functional-at risk with downward trend areas toward PFC. Erosion from roads and trails has been reduced with improved road construction and maintenance methods. Continued improvement in conservation and control methods for riparian and wetland vegetation buffers in the planning area would increase the functionality of riparian and wetland areas and control accelerated erosion, compaction, and sedimentation. Grazing management and monitoring has improved or maintained properly functioning riparian and wetland areas.

Alternative A (No Action)

Alternative A would contribute to a moderate risk of adverse impacts to riparian-wetland areas; however, PFC or an improving trend leading to PFC would be maintained. Buffers would not be established to maintain riparian-wetland areas, and non-oil and gas surface disturbance would be allowed in riparian-wetland areas. Surface disturbance associated with oil and gas activities would be allowed in wetlands, floodplains of non-major rivers, and 80 percent of the federal mineral estate in the planning area without stipulations.

Management actions proposed under Alternative A have historically led to the degradation of some riparian-wetland areas. If this were to continue, the BLM would continue taking corrective action to limit the duration of impacts to riparian-wetland areas. However, the condition of riparian-wetland areas within BLM-administered lands is often a function of management occurring upstream and downstream on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM's ability to achieve PFC in riparian-wetland areas may be limited by the capability of the site due to impacts on non-BLM-administered lands. These impacts include, but are not limited to: 1) upstream impacts such as alterations in sediment delivery or stream flow, channel or floodplain manipulations, and sources of invasive species, 2) downstream impacts such as headcut migration and channel and floodplain manipulations, and 3) impacts immediately adjacent to riparian-wetland areas such as channel and floodplain manipulations (e.g., highways and railroads). Where these impacts occur, it may be impossible to achieve PFC, and the site capability may be the highest level of functionality that can be achieved.

Alternative B

Alternative B would contribute to a reduced risk of adverse impacts to riparian-wetland areas compared to Alternative A. PFC or an improving trend leading to PFC would be maintained through reduced livestock grazing, restricted OHV use, and restricted or prohibited surface disturbance, particularly in and near waterbodies, floodplains, and riparian-wetland areas. These actions would increase riparian vigor and decrease impacts from surface disturbance in upland areas. The physical and biological connections between the riparian areas and streams would be maintained.

The BLM would continue taking corrective action to limit the duration of impacts to riparian-wetland areas in situations where these impacts occur. However, the condition of riparian-wetland areas within BLM-administered lands is often a function of management occurring upstream and downstream on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream

length. In these mixed-ownership watersheds, the BLM's ability to achieve PFC in riparian-wetland areas may be limited by the capability of the site due to impacts on non-BLM-administered lands. These impacts include, but are not limited to: 1) upstream impacts such as alterations in sediment delivery or stream flow, channel or floodplain manipulations, and sources of invasive species, 2) downstream impacts such as headcut migration and channel and floodplain manipulations, and 3) impacts immediately adjacent to riparian-wetland areas such as channel and floodplain manipulations (e.g., highways and railroads). Where these impacts occur, it may be impossible to achieve PFC, and the site capability may be the highest level of functionality that can be achieved.

Alternative C

Alternative C would contribute to a reduced risk of adverse impacts to riparian-wetland areas compared to Alternative A. PFC or an improving trend leading to PFC would be maintained by avoiding surface-disturbing activities in riparian-wetland areas and only allowing them with design features to maintain or improve the functionality of the riparian-wetland area.

The BLM would continue taking corrective action to limit the duration of impacts to riparian-wetland areas in situations where these impacts occur. However, the condition of riparian-wetland areas within BLM-administered lands is often a function of management occurring upstream and downstream on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM's ability to achieve PFC in riparian-wetland areas may be limited by the capability of the site due to impacts on non-BLM-administered lands. These impacts include, but are not limited to: 1) upstream impacts such as alterations in sediment delivery or stream flow, channel or floodplain manipulations, and sources of invasive species, 2) downstream impacts such as headcut migration and channel and floodplain manipulations, and 3) impacts immediately adjacent to riparian-wetland areas such as channel and floodplain manipulations (e.g., highways and railroads). Where these impacts occur, it may be impossible to achieve PFC, and the site capability may be the highest level of functionality that can be achieved.

Alternative D

Alternative D would contribute to a reduced risk of adverse impacts to riparian-wetland areas compared to Alternative A. PFC or an improving trend leading to PFC would be maintained by avoiding surface-disturbing activities in riparian-wetland areas and only allowing them with design features to maintain or improve the functionality of the riparian-wetland area.

The BLM would continue taking corrective action to limit the duration of impacts to riparian-wetland areas in situations where these impacts occur. However, the condition of riparian-wetland areas within BLM-administered lands is often a function of management occurring upstream and downstream on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM's ability to achieve PFC in riparian-wetland areas may be limited by the capability of the site due to impacts on non-BLM-administered lands. These impacts include, but are not limited to: 1) upstream impacts such as alterations in sediment delivery or stream flow, channel or floodplain manipulations, and sources of invasive species, 2) downstream impacts such as headcut migration and channel and floodplain manipulations, and 3) impacts immediately adjacent to riparian-wetland areas such as channel and floodplain manipulations (e.g., highways and railroads). Where these impacts occur, it may be impossible to achieve PFC, and the site capability may be the highest level of functionality that can be achieved.

Alternative E (Proposed)

Alternative E would contribute to a reduced risk of adverse impacts to riparian-wetland areas compared to Alternative A. PFC or an improving trend leading to PFC would be maintained through restricted OHV use, use of buffers adjacent to riparian-wetland areas, and restricted or prohibited surface disturbance, particularly in and near streams, waterbodies, floodplains, riparian-wetland areas. These actions would increase riparian

vigor and decrease impacts from surface disturbance in upland areas. The physical and biological connections between the riparian areas and streams would be maintained.

The BLM would continue taking corrective action to limit the duration of impacts to riparian-wetland areas in situations where these impacts occur. However, the condition of riparian-wetland areas within BLM-administered lands is often a function of management occurring upstream and downstream on multiple ownerships. BLM lands often comprise a very small portion of the total watershed area and total stream length. In these mixed-ownership watersheds, the BLM's ability to achieve PFC in riparian-wetland areas may be limited by the capability of the site due to impacts on non-BLM-administered lands. These impacts include, but are not limited to: 1) upstream impacts such as alterations in sediment delivery or stream flow, channel or floodplain manipulations, and sources of invasive species, 2) downstream impacts such as headcut migration and channel and floodplain manipulations, and 3) impacts immediately adjacent to riparian-wetland areas such as channel and floodplain manipulations (e.g., highways and railroads). Where these impacts occur, it may be impossible to achieve PFC, and the site capability may be the highest level of functionality that can be achieved.

INVASIVE SPECIES

This section describes potential impacts to invasive species management, from resource management actions and resource use programs. Impacts to invasive species and their management result from surface-disturbing activities, including fire and activities that remove vegetation, create bare soil, or mechanically impact plants.

FLPMA and the Standards for Rangeland Health direct the BLM to manage vegetation resources toward the maintenance and/or restoration of the physical function and biological health of these communities. The objectives are to maintain and improve the condition and trend of these plant communities within their respective ecological sites. This would provide for many resources and resource uses within these sites. Examples include beneficial impacts to livestock grazing, wildlife habitat, recreation, and soil and water.

SUMMARY OF IMPACTS

Impacts to invasive species management typically results from actions that disturb the soil or that otherwise create habitats (seedbed) for the establishment or expansion of invasive species.

Alternatives that involve the most projected surface disturbance would have the potential to result in the greatest spread of invasive species. Stringent reclamation requirements, especially reclamation plans before surface disturbance, would decrease long-term disturbance and the likelihood of invasive species establishment and expansion.

Alternatives allowing more vegetation treatments would provide for ecological health by maintaining or moving plant communities toward those reflective of desired communities in appropriate ecological sites. Plant communities reflective of pertinent ecological sites would be resilient to natural disturbance processes and subsequently resistant to invasive species establishment or expansion.

Alternatives allowing more surface disturbance or development, will generally impact more acres of plant communities depending on timing and effectiveness of reclamation. Managing resource uses for meeting Land Health Standards will maintain or provide for plant communities.

Alternatives that reduce opportunity to treat vegetation would shift some plant communities away from desired plant communities. For example weed control efforts may be limited where vehicle access is limited or risk of severe wildfire may be increased where vegetation treatment opportunities are limited.

ASSUMPTIONS AND METHODOLOGY

Short-term effects to invasive species management would be the most prevalent at any given time depending on reclamation timing and effectiveness. Longer term effects to vegetation would occur less often, but impact plant communities longer.

Effects of surface disturbance would impact a fraction of the total acres projected for this alternative at any given time depending on type (short vs. long-term) and timing of disturbance.

Assumptions for invasive species are described below:

- Constant seed sources from wildlife movement, rivers, recreationists, and general public land use would prevent eradication of invasive species over the life of the RMP. Domestic animals, wildlife, recreationists, clothing, pets, and hay contribute to the spread of invasive species as do many other activities in daily life (such as water, air, and vehicle travel and animal transportation).
- Increased surface disturbance would increase potential for invasive species establishment or expansion.
- Invasive vegetation species not known to occur in the planning area would occur.
- Increases in invasive vegetation species would reduce habitat quality and quantity.
- The demand for control of weeds is expected to increase as general public knowledge of the detrimental impacts of invasive species increases.
- Control of invasive vegetation species would continue to be a combination of mechanical, chemical, biological, or manual methods.
- The BLM would manage invasive species designated noxious by the State of Montana and prioritize treatments.

IMPACTS COMMON TO ALL ALTERNATIVES

Reclamation plans for approved surface-disturbing activities would reduce invasive species seed spread and require the use of weed free seed mixtures.

Vegetation management, including livestock grazing, that met Rangeland Health Standards and supported endangered species, wildlife, water quality, and fisheries would support native vegetation and enhance its ability to outcompete invasive species infestations. These actions would reduce invasive species establishment and spread.

Maintaining consistency for vegetative manipulation (or prescriptive) treatments (including chemical, fire, biological, manual, and mechanical methods) with the guidelines stated in specific plans under Vegetation, Invasive Species actions would support minimal invasive species spread and use an Integrated Weed Management approach to treat invasive species.

Establishing riparian buffer zones to trap silt from surface runoff and prevent it from entering and affecting the riparian wetland system would reduce the spread of weed seeds that may be dispersed with the silt.

Using temporary or permanent enclosures (i.e., in woody draw or riparian areas) to promote species diversity, recruitment, and functionality would allow for stronger native species competition and decrease the potential for invasive species infestations.

Allowing woody and non-woody vegetation mechanical thinning, biomass removal and chemical and biological treatments to reduce hazardous fuels would also aid in invasive species treatments by removing dense vegetation and permitting access to these areas.

Allowing the removal of woody and non-woody biomass products, commercial or personal use in forest and woodlands, or the salvage of dead and dying timber would increase risk of spread of invasive species seed during the removal process. An invasive species prevention plan would need to be in place prior to these activities.

Limited OHV use would reduce the risk of spread of invasive species across the planning area by confining potential new infestations to established disturbance areas (existing roads and trails).

Implementing new travel management areas would decrease the probability of spreading invasive species into new areas by vehicles (weed seeds falling from vehicles that passed through infestations in other areas).

Avoiding or limiting surface disturbance on steeper slopes or highly erodible soils would decrease risk of invasive species invasion or expansion.
Removal of cottonwoods or other fuel wood removals would increase risk of invasive spread or introduction.

Suspending or deferring livestock grazing following surface disturbance until resource objectives are met would allow native plant communities to reestablish sufficiently to maintain watershed function and stability, and resiliency against invasive species expansion and establishment.

ALTERNATIVE A (No Action)

Summary Statement

This alternative projects approximately 75,000 acres, or 2.7% of BLM administered surface acres, of surface disturbance (See *Disturbance Appendix*). Disturbed acres short-term would be 62,000 and acres disturbed long-term would be 12,000. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity of existing infestations.

Treating invasive species infestations on a case-by-case basis, which is not the most cost-efficient method, would not allow for an overall holistic approach in managing the program. For example: treating invasive species in the northern part of the planning area and then treating invasive species in the southern part of the planning area the next day would increase the overall cost of treatment per acre.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 48,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term (See Disturbance Table). This would increase resiliency to invasive species infestation and expansion.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 27,000 acres in the short-term and 12,000 acres in the long-term. For short and long-term disturbances, vegetative communities would lose site stability until reclamation was complete. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established.

Allowing surface-disturbing activities in areas of invasive species infestations would increase the potential of weed-seed spread. An operation plan for washing equipment would need to be in place.
Allowing prescribed fire in Category B and C Fire Management Categories (the entire planning area), would impact vegetation through disturbance. Commonly, invasive species appear in the short-term following prescribed fire until reestablishment of desired vegetative communities. Favorable conditions would allow prescribed fire to accelerate nutrient cycling, sprouting, and forage availability. Very intense burning would decrease sprouting and forage growth and increase the possibility of invasive species.

NSO stipulations for oil and gas leasing and development would protect vegetation and prevent soil compaction and vegetation removal.

OHV use on BLM-administered lands would result in short- and long-term impacts to vegetation in grassland and shrubland communities. Depending on soil conditions, slope, and ground cover, light OHV use would disturb the soil surface and cause physical damage to vegetation by breaking stems and branches. However, plants and disturbed areas would recover from light disturbance. With increased use, new trails would be established, which would result in soil erosion, invasive seed introduction into grassland and shrubland habitats, and long-term vegetation losses. OHV use would be open on 2,400 acres which would be more susceptible to invasive species infestation or expansion.

Special Designations

OHV use would be closed on 80 acres (Smokey Butte ACEC) reducing risk of invasive species invasion or expansion.

ALTERNATIVE B

Summary Statement

This alternative projects approximately 35,000 acres of surface disturbance in the short-term and 8,200 in the long-term. Under this alternative, the spread of invasive plant species would be controlled in some areas but not in others. Factors affecting the spread or control of invasive species would include the frequency and amount of motorized traffic and recreational use on public lands in the planning area, development occurring on private lands adjacent to BLM-administered lands, and the type of actions occurring on federal, state, and private lands. Any actions that limited the treatment of invasive species on public lands would potentially limit the efficacy of treatments on lands with other ownership or administration. The cumulative impacts of reducing the efficacy on invasive species would potentially decrease the amount and availability of native forage for livestock and wildlife and contribute to soil erosion and increased sediment loads in streams.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 18,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term.

Where vegetation restoration projects are limited, native plant communities would lose resiliency against invasive species or other disturbance such as fire, drought or insect infestations.

Management of wildfire under alternatives B, C, D, and E, to meet multiple objectives would have a long-term impact on vegetation by accelerating nutrient cycling, sprouting, and forage availability, and promoting restoration or maintenance of native plant community distribution and function.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 17,000 acres in the short-term and 8,300 acres in the long-term. For short and long-term disturbances, vegetative communities would lose site stability until reclamation was complete. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established. Prohibiting surface-disturbing activities in areas of invasive species infestations would limit the spread of weed seeds, which would assist in meeting BLM goals.

Restricting grazing of domestic sheep or goats for invasive species control in or near the Bighorn Sheep Range would prevent use of the most cost-effective method of invasive species control along the Powder River.

Closing livestock grazing allotments that failed to meet Standard for Rangeland Health within 5 years of a “not meeting” determination would limit grazing and Integrated Weed Management (which is the best and most cost-effective tool for combating invasive species).

Targeted grazing of invasive species using sheep would support desirable plant species. Restricting this activity would allow invasive species to spread and impact native plant communities.

Depending on soil conditions, slope, and ground cover, light OHV use would disturb the soil surface and cause physical damage to vegetation by breaking stems and branches. However, plants and disturbed areas would recover from light disturbance. With increased use, new trails would be established, which would

result in soil erosion, invasive seed introduction into grassland and shrubland habitats, and long-term vegetation losses. OHV use would be open on 2,900 acres which would be more susceptible to invasive species infestation or expansion.

Under Alternative B, 0.1% of the acres in the planning area could potentially be disturbed by BLM actions. The risk of invasive species infestations and spread is slightly lower than the other alternatives.

Special Designations

OHV use would be closed on 35,000 acres (SRMAs and ACECs) reducing risk of invasive species invasion or expansion.

ALTERNATIVE C

Summary Statement

This alternative projects approximately 73,000 acres of surface disturbance in the short-term and 11,000 in the long-term. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity and type of existing infestations.

Allowing surface-disturbing activities within areas of invasive species infestations only with approved mitigation measures would limit the possibility of seed spread through timing stipulations or equipment washing.

Using Early Detection Rapid Response to designate priority treatment areas would emphasize the newest, most efficient technological system for invasive species treatments. Because the majority of invasive species are spread in publicly accessible areas, primary invasive species control in these areas would minimize impacts.

This alternative would prioritize publicly accessible areas, riparian areas, and special status species habitat areas for invasive species treatment efforts. Emergency stabilization and rehabilitation areas and areas with treatments occurring adjacent would not be prioritized for treatment. Prioritizing areas for treatment would focus treatment efforts on these areas first. Invasive species would expand in other areas.

Wildfire would be managed for multiple objectives as under alternative B.

Resources

Impacts from resources vegetation treatment projects including water/riparian and fish & wildlife would affect up to 47,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term (Table 4-23 under Vegetation). Management of wildfire to meet multiple objectives would have a long-term impact on vegetation by accelerating nutrient cycling, sprouting, and forage availability.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 26,000 acres in the short-term and 11,000 acres in the long-term. For short and long-term disturbances, vegetative communities would lose site stability until reclamation was complete. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established.

Allowing disruptive activities within 2 miles of sharp-tailed grouse leks with specialized design features, which would most likely consist of timing stipulations, would allow invasive vegetation species (weed) treatments in these areas and improve the habitat.

Suspending livestock use on grazing allotments that failed to meet Standard for Rangeland Health within 5 years of a "not meeting" determination would limit grazing and Integrated Weed Management (which is the best and most cost-effective tool for combating invasive species).

Domestic sheep grazing for invasive species control would be allowed within 14.3 miles of the Bighorn Sheep Range under this alternative with specialized design features (such as an on-site, round-the-clock sheepherder). Domestic sheep grazing is an important tool for controlling invasive species and the most cost-effective, integrated approach.

Allowing prescribed fire throughout the planning area would increase the risk of spread of invasive species through vegetation disturbance.

Allowing big game retrieval would promote invasive species seed spread onto BLM-administered lands via vehicles.

Although avoiding or restricting surface-disturbing and disruptive activities or requiring burial of power lines would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages.

Allowing surface-disturbing activities in areas of invasive species infestations would increase the potential for weed infestations and expansion, and decrease the stability of desirable vegetative communities.

Using Early Detection Rapid Response for controlling invasive species in publicly accessible areas, riparian areas, and special status species habitats would assist in recovering vegetation to its native state. Prioritizing these areas of treatment would reduce the degree of spread by invasive species in these areas (and other areas) by eliminating or significantly decreasing weed infestations, which would decrease the possibility of invasive species seed dispersal on other lands.

OHV use on BLM-administered lands would result in short- and long-term impacts to vegetation in grassland and shrubland communities. Depending on soil conditions, slope, and ground cover, light OHV use would disturb the soil surface and cause physical damage to vegetation by breaking stems and branches. However, plants and disturbed areas would recover from light disturbance. With increased use, new trails would be established, which would result in soil erosion, invasive seed introduction into grassland and shrubland habitats, and long-term vegetation losses. OHV use would be open on 640 acres which would be more susceptible to invasive species infestation or expansion.

Under Alternative C, 0.4% of the acres in the planning area could potentially be disturbed by BLM actions. The risk of invasive species infestations and spread is slightly higher than Alternatives A and B.

Special Designations

OHV use would be closed on 550 acres (SRMAs and ACECs) reducing risk of invasive species invasion or expansion.

ALTERNATIVE D

Summary Statement

This alternative projects approximately 80,000 acres of short-term surface disturbance and 12,000 acres of long-term disturbance. Surface disturbance would affect plant communities depending on timing and effectiveness of reclamation. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity and type of existing infestations.

Although allowing surface-disturbing activities would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would affect the relative abundance, distribution, and

occurrence of seral stages. Surface-disturbing activities would create desirable conditions for invasive species infestations.

Treating invasive weed species only in areas in which landowners were actively controlling invasive species would not represent a holistic approach. Although cooperating with landowners is beneficial, it is not cost effective or the most efficient method when treating invasive species with a landscape approach.

Domestic sheep grazing for invasive species control would be allowed under this alternative with specialized design features (such as an on-site, round-the-clock sheepherder). Domestic sheep grazing is an important tool for controlling invasive species and the most cost-effective, integrated approach.

Resources

Impacts from resources projects including water/riparian and fish & wildlife would affect up to 48,106 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term.

Wildfire would be managed for multiple objectives as under alternative B.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 32,000 acres in the short-term and 12,000 acres in the long-term. For short and long-term disturbances, vegetative communities would lose site stability until reclamation was complete. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established.

Allowing surface-disturbing activities within areas of invasive species infestations only with approved mitigation measures would limit the possibility of seed spread through timing stipulations or equipment washing.

Suspending livestock use on grazing allotments that failed to meet Standard for Rangeland Health within 5 years of a “not meeting” determination would limit grazing and Integrated Weed Management (which is the best and most cost-effective tool for combating invasive species).

Allowing prescribed fire throughout the entire planning area would impact vegetation through disturbance. Commonly, invasive species appear in the short-term following prescribed fire until reestablishment of desired vegetative communities. Favorable conditions would allow prescribed fire to accelerate nutrient cycling, sprouting, and forage availability. Very intense burning would decrease sprouting and forage growth and increase the occurrence of invasive species.

Allowing big game retrieval would promote invasive species seed spread onto BLM-administered lands through vehicle traffic.

Allowing surface-disturbing and disruptive activities or requiring burial of power lines would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages.

Allowing surface-disturbing activities in areas of invasive species infestations only with approved measures would increase the potential for weed infestations and expansion and decrease the vigor of desirable vegetative species.

OHV use on BLM-administered lands would result in short- and long-term impacts to vegetation in grassland and shrubland communities. Depending on soil conditions, slope, and ground cover, light OHV use would disturb the soil surface and cause physical damage to vegetation by breaking stems and branches. However, plants and disturbed areas would recover from light disturbance. With increased use, new trails would be

established, which would result in soil erosion, invasive seed introduction into grassland and shrubland habitats, and long-term vegetation losses. OHV use would be open on 2,000 acres which would be more susceptible to invasive species infestation or expansion.

Under Alternative D, 0.4% of the acres in the planning area could potentially be disturbed by BLM actions. The risk of invasive species infestations and spread is slightly higher than the Alternatives A and B.

Special Designations

OHV use would not be closed on any special designated areas. Risk of invasive species invasion or expansion would not be reduced on these areas.

ALTERNATIVE E (Proposed)

Summary Statement

This alternative projects approximately 79,000 acres of surface disturbance in the short-term and 12,000 acres of surface disturbance in the long-term. Surface disturbance would affect plant communities depending on timing and effectiveness of reclamation. Surface disturbance increases risk of invasive species infestation or expansion depending on proximity and type of existing infestations.

Although allowing surface-disturbing activities would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would affect the relative abundance, distribution, and occurrence of seral stages. Surface-disturbing activities would create desirable conditions for invasive species infestations.

Using Early Detection Rapid Response to designate priority treatment areas would emphasize the newest, most efficient technological system for invasive species treatments. Because the majority of invasive species are spread in publicly accessible areas, and areas with active reclamation, prioritizing invasive species control in these areas would minimize impacts.

Domestic sheep grazing for invasive species control would be allowed under this alternative with specialized design features (such as an on-site, round-the-clock sheepherder). Domestic sheep grazing is an important tool for controlling invasive species and the most cost-effective, integrated approach.

Resources

Impacts from resources projects including water/riparian and fish & wildlife would affect up to 48,000 acres in the short-term, and would be designed to maintain or enhance ecological processes including providing for healthy native plant communities in the long-term (Table 4-23 under Vegetation).

Wildfire would be managed for multiple objectives as under alternative B.

Resource Uses

Resource uses including oil and gas, coal, locatable minerals, renewable energy, realty, recreation, livestock grazing (range improvement projects), forestry, and prescribed fire would disturb up to 31,000 acres in the short-term and 12,000 acres in the long-term. For short and long-term disturbances, vegetative communities would lose site stability until reclamation was complete. Plant communities would reflect earlier seral species and risk of weed infestation would be greater until the native plant community became re-established.

Allowing prescribed fire throughout the entire planning area would impact vegetation through disturbance. Commonly, invasive species appear in the short-term following prescribed fire until reestablishment of desired vegetative communities. Favorable conditions would allow prescribed fire to accelerate nutrient cycling, sprouting, and forage availability. Very intense burning would decrease sprouting and forage growth and increase the occurrence of invasive species.

Suspending livestock use on grazing allotments that failed to meet Standard for Rangeland Health within 5 years of a "not meeting" determination would limit grazing and Integrated Weed Management (which is the best and most cost-effective tool for combating invasive species).

Limiting OHV use to existing roads in the camping and boating ramp area and closing OHV use on the east side of the walking trail through the island in the Howrey Island ACEC would assist in controlling the spread of invasive species.

Allowing surface-disturbing and disruptive activities or requiring burial of power lines would not result in the complete elimination of a plant species, plant community, or seral stage, these activities would impact the relative abundance, distribution, and occurrence of seral stages in the specific project areas. Specialized design features would be used to mitigate possible negative impacts.

Allowing surface-disturbing activities in areas of invasive species infestations would increase the potential for weed infestations and expansion and decrease the resiliency of desirable vegetative communities.

Using Early Detection Rapid Response for controlling invasive species in publicly accessible areas, riparian areas, emergency stabilization and rehabilitation areas, and special status species habitat areas would assist in recovering vegetation to its native state. Prioritizing these areas of treatment would reduce the degree of spread by invasive species in these areas (and other areas) by eliminating or significantly decreasing weed infestations, which would decrease the possibility of invasive species seed dispersal on other lands.

Although closing livestock grazing in allotments that failed Standards for Rangeland Health and made no progress toward meeting those goals within 5 years would improve vegetation in the short-term, vegetation would be dominated by older plants, contain a high litter cover, and experience reduced recruitment over the long-term.

OHV use on BLM-administered lands would result in short- and long-term impacts to vegetation in grassland and shrubland communities. Depending on soil conditions, slope, and ground cover, light OHV use would disturb the soil surface and cause physical damage to vegetation by breaking stems and branches. However, plants and disturbed areas would recover from light disturbance. With increased use, new trails would be established, which would result in soil erosion, invasive seed introduction into grassland and shrubland habitats, and long-term vegetation losses. No open OHV areas on BLM-administered lands would result in a reduced risk of invasive species invasion or expansion.

Under Alternative E, 0.4% of the acres in the planning area could potentially be disturbed by BLM actions. The risk of invasive species infestations and spread is slightly higher than the Alternatives A and B.

Special Designations

OHV use would be closed on 2800 acres which includes Long Medicine Wheel and Walstein ACECs. This would reduce risk of invasive species invasion or expansion in areas not authorized for OHV use.

CUMULATIVE IMPACTS

Management of invasive species would not reduce the total number of invasive-species-infested acres within the planning area because treatments would not exceed the rate of expansion under any alternative. Natural expansion of previous biological releases without treatments would occur at a rate of approximately 14 percent per year (BLM 1996). Alternative prescriptions would affect the locations and quantity of invasive species (vegetation) treatments, and invasive species populations would decline in vigor and extent on treated sites. Prioritized treatment areas and coordination of invasive species management with federal, state, county, and private landowners and organizations would result in more effective and cost-efficient invasive species control because treatments would address the natural boundaries of the infestations and management resources could be shared between partners, which would protect more acres from new infestations and control more acres of existing weed infestations. Using Integrated Weed Management would also assist with invasive species

(vegetation) control by focusing the multiple methods of invasive species management on the conditions that affect invasive species population size and outbreak of new infestations.

Increases in invasive species (vegetation) acreage within the planning area would result primarily from expansion of existing invasive species infestations supplemented by new infestations. Invasive species (vegetation) population size is dependent on three conditions: the relative amount of invasive species seed or root sources for reproduction, the availability of safe sites for germination or propagation, and access to the necessary resources for plant growth, which are sunlight, water, and nutrients.

Management actions that reduced these conditions would limit invasive species population size while actions that produced these conditions would usually increase invasive species population size. Promoting healthy desired vegetation is the most common and long-term reducer of invasive species populations because the desired plants continually compete with weeds in producing seeds, occupying germination sites, and acquiring resources for growth. Vegetation restoration and fire rehabilitation activities, including re-vegetation and protection of post-fire plantings, would be effective methods for improving desired vegetation populations, although vegetation treatments would potentially initially cause weeds to increase through associated ground disturbance. Vegetation treatments that restore grasslands, shrublands, and riparian areas would be particularly effective in reducing potential invasive species spread because most invasive species occur in these habitats. Using weed-seed-free forage and cleaning vehicles and equipment would decrease invasive species seed and root sources; thereby reducing the number of new infestations. Education and outreach would reduce invasive species establishment and spread because people often act once informed about the impacts of invasive species on ecosystem health and economics. Education about methods for invasive species management would also assist.

Ground-disturbing activities would be the biggest increase of both new and existing weed infestations because they often bring in seeds on equipment and vehicles, create bare spots for seed germination, and reduce competition for resources by removing desired vegetation. Fire retardant and burning of natural fuels release compounds useful for plant growth, thereby benefiting colonizing plants, particularly invasive species, by providing a surplus of nutrients. Therefore, forest management designed to reduce unnaturally large and severe wildfires would reduce the potential for increased invasive species populations. Motorized public travel and camping within 300 feet of existing roads, acquisition of easements and exchanges to improve access to public lands, and use of SRMAs could potentially increase human use through hiking, camping, hunting, horseback riding, and driving for pleasure; thereby increasing both disturbance and the risk of igniting wildfires, which could lead to expansions in invasive species populations. Other management activities that caused surface disturbances would also increase the potential for new invasive species infestations, although most activities incorporate methods to reduce introduction and expansion of invasive species infestations like minimizing new road construction in invasive-species infested areas, reseeding disturbed and exposed soils where necessary, and locating new utility facilities in existing ROWs.

The degree to which invasive species populations impact their environments depends on the cumulative effect of infestations on the resiliency and sustainability of the desired plant community. Infestations that are a non-dominant part of a diverse, otherwise healthy desired plant community that controls the size and density of the infestations would cause reduced impacts. Infestations would have a high impact when they dominate the plant community and are substantially reducing its sustainability and resiliency by negatively affecting the water cycle, erosion potential, nutrient cycling, and forage availability for wildlife and livestock. Infestations that affect some or all of these things but do not yet substantially reduce the community's sustainability or resiliency would have a medium, or moderate, impact.

Climate change is likely to combine with other human-induced stress to further increase the vulnerability of ecosystems to other pests, invasive species, and loss of native species.

Alternative A (No Action)

The spread of invasive species caused by equipment movement under Alternative A would potentially impact the ecological status of vegetation in the planning area. Invasive species would continue to spread under this alternative.

Scattered patches of knapweed, which has a high potential to spread, have been found in the planning area. Tamarisk or salt-cedar, an introduced ornamental, has had devastating impacts in the southwest, has outcompeted native riparian plants, and completely eradicated some riparian areas because it requires large volumes of water. Tamarisk has been observed along isolated waterbodies; the Fort Peck Reservoir; and the Yellowstone, Tongue, and Powder rivers and their tributaries.

Under this alternative, the spread of invasive plant species, including invasive species, would be controlled in some areas but spread more rapidly in others. Factors affecting the spread or control of invasive species would include the frequency and amount of motorized traffic and recreational use on public lands in the planning area, development occurring on private lands adjacent to BLM-administered lands, and the type of actions occurring on federal, state, and private lands. Any actions that limited the treatment of invasive species on public lands would potentially limit the efficacy of treatments on lands with other ownership or administration. The cumulative impacts of reducing the efficacy of control on invasive species and invasive species would potentially decrease the amount and availability of native forage for livestock and wildlife and contribute to soil erosion and increased sediment loads in streams.

Alternative B

The spread of invasive species caused by restrictions to sheep grazing under Alternative B would potentially impact the ecological status of vegetation in the planning area. Invasive species would continue to spread. Leafy spurge has been observed along isolated waterbodies and the Yellowstone, Tongue, and Powder rivers and their tributaries. Sheep grazing would be the best method for controlling leafy spurge along waterways.

Alternative C

Allowing sheep grazing with specialized design features under Alternative C would reduce the impacts to the ecological status of vegetation in the planning area. Invasive species would continue to spread. Leafy spurge has been observed along isolated waterbodies and the Yellowstone, Tongue, and Powder rivers and their tributaries. Sheep grazing would be the best method for controlling leafy spurge along waterways.

Alternative D

The spread of invasive species caused by equipment movement under Alternative D would potentially impact the ecological status of vegetation in the planning area. Invasive species would continue to spread.

Scattered patches of spotted and Russian knapweed have been found in the planning area. Tamarisk or salt-cedar, an introduced ornamental, has had devastating impacts in the southwest, outcompeted native riparian plants, and completely eradicated some riparian areas because with its need for large volumes of water. Tamarisk and spotted knapweed have been observed along isolated waterbodies and the Yellowstone, Tongue, and Powder rivers and their tributaries.

Alternative E (Proposed)

Allowing sheep grazing with specialized design features under Alternative C would reduce impacts to the ecological status of vegetation in the planning area. Invasive species would continue to spread, however priority areas would be treated to limit the extent and density of infestations. Leafy spurge has been observed along isolated waterbodies and the Yellowstone, Tongue, and Powder rivers and their tributaries. Sheep grazing would be the best method for controlling leafy spurge along waterways.

Scattered patches of spotted and Russian knapweed have been found in the planning area. Tamarisk or salt-cedar, an introduced ornamental, has had devastating impacts in the southwest, outcompeted native riparian plants, and completely eradicated some riparian areas with its need for large volumes of water. Tamarisk and spotted knapweed have been observed along isolated waterbodies and the Yellowstone, Tongue, and Powder rivers and their tributaries.

FISH, AQUATIC AND WILDLIFE HABITAT, INCLUDING SPECIAL STATUS SPECIES

Surface disturbing and disruptive actives have the potential to alter the quantity and quality of wildlife habitat, both directly and indirectly. While the direct impact to the wildlife habitat (e.g. the physical removal of soil and vegetation) can be estimated through assumptions from the various resource use programs, indirect effects (e.g. noise) to wildlife are more difficult to quantify.

As provided in Chapter 1, project proposals are required to be in conformance with the goals and objectives for all resources including those identified in Chapter 2 - Fish, Aquatic, and Wildlife Habitat, Including Special Status Species. There would be further impact analysis done during the NEPA process at the project level; and if required additional land use planning would be conducted in cooperation with federal and state agencies; and include public involvement.

Management actions within Alternative A focuses on the stipulations for oil and gas leasing and generally does not provide for specific management actions in relation to other resource uses (e.g. rights-of-way). Conversely, Alternatives B, C, D and E define consistent management actions for all surface disturbing or disruptive activities on BLM-administered lands or mineral estate. For example, the CSU stipulation for oil and gas leasing within crucial big game winter range is mirrored in other BLM authorized activities outside of oil and gas development. Table 4-24 identifies the level of conservation of wildlife habitats related to BLM authorized oil and gas related surface disturbing or disruptive activities; and therefore can be used as an inference to the conservation of wildlife habitat in relation to other resource uses that could be authorized by the BLM.

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in the impact analysis include the following:

- Future surface disturbing activities would be required to meet the goals and objectives in Chapter 2 - Fish, Aquatic and Wildlife Habitat, Including Special Status Species.
- Surface disturbing or disruptive activities applies to activities authorized by BLM, unless otherwise noted.
- The larger the area of disturbance and the longer duration of the disturbing or disruptive activity, the greater the adverse impacts to wildlife habitat resources.
- There would be future changes in federally listed threatened or endangered and BLM special status species.
- There would be one to five aquatic wildlife projects constructed each year, disturbing 10 to 100 acres annually.
- There would be one to five terrestrial wildlife habitat projects constructed or implemented each year, disturbing 100 to 250 acres annually.
- Because fragmentation impacts wildlife habitat, the more acres of habitat protected from fragmentation, the greater benefits to wildlife species; therefore alternatives proposing to protect greater portions of landscapes from resource use related fragmentation are anticipated to be most beneficial to maintaining wildlife habitat functionality.
- Prohibiting surface disturbance or occupancy constitute a more restrictive action and provide greater certainty for protection of wildlife habitat than avoiding surface disturbance or occupancy.
- The availability, quality, and quantity of wildlife habitat correlate to the viability, health, and size of wildlife populations.
- BLM utilizes best available information, peer-reviewed science, management and conservation plans, research, and BLM directives, as appropriate; to guide fish, aquatic and wildlife habitat management.
- Delineations of important wildlife habitats (e.g., grouse leks, crucial winter ranges, raptor nests) would be modified based on habitat monitoring, wildlife population surveys, and other information provided by industry, BLM, and MFWP.
- Impact analysis and conclusions are based on BLM interdisciplinary team knowledge of resources, existing literature, and information provided by other agencies and institutions.
- Surface disturbing activities could positively or negatively impact habitat quantity or quality, or result in increases or decreases of individuals, depending on the amount of area disturbed, the nature of the disturbance, the species affected, and location of the disturbance.

- Wildlife species would be able to sustain disturbance or wildlife habitat degradation to a specific threshold before experiencing a reduction in population viability. The timing of the disturbance or type of disruptive activity would influence the threshold a wildlife species would be able tolerate.
- Potential changes in climate would increase surface water temperature, alter precipitation and runoff patterns, and alter riparian habitats.
- Where wildlife habitats exist in their natural undisturbed state, management actions prohibiting surface disturbance would provide for the maintenance of wildlife habitat functionality by eliminating anthropogenic impacts. This same prohibition would result in the inability to implement surface disturbing activities designed to improve habitat, which would result in decreased wildlife habitat functionality.
- The location of future surface disturbing activities cannot be predicted at the RMP level. Surface disturbing activities are assumed to occur in vegetation types in proportion to their availability.
- Acres identified as a part of the impact comparison analysis are estimates and not a predictor of future events due to factors outside the control of the BLM.
- Acres and other data used in this analysis are approximate projections for comparison and analytical purposes and reflect acres of surface disturbance from BLM authorized activities.
- Protections for wildlife habitat are not guaranteed from other resource's oil and gas leasing stipulations. Stipulations derived to protect a given resource may be changed through the application of Waivers, Exception or Modifications (WEMs). Where WEMs are granted for non-wildlife resources, there is no assurance wildlife or their habitats would be protected outside of wildlife specific stipulations or mitigation prescribed in the site specific NEPA document.

IMPACTS COMMON TO ALL ALTERNATIVES

Emphasizing native plant reestablishment and soil resource management through the requirements in the *Reclamation, Mitigation Measures and Conservation Actions*, and *GRSG Required Design Features Appendices* would improve the success in the restoration of wildlife habitats though the utilization of appropriate plant species and the specific requirements for areas of poor reclamation suitability.

Surface disturbing activities designed to meet or exceed Montana water standards would support or maintain aquatic wildlife habitat.

Surface disturbing activities would be completed in accordance with the *Mitigation Measures and Conservation Actions* and *GRSG Required Design Features Appendices* , which would result in the avoidance of wildlife habitat; and where authorized minimize and, if necessary, compensate for wildlife habitat loss and fragmentation.

Migratory bird nesting habitat would be conserved by ensuring surface disturbing activities are implemented in a manner that maintains local and regional migratory bird species' population.

Predator control activities on BLM-administered lands would result in a short-term decrease in the target predator species and a potential increase in some non-target wildlife species. This would increase the functionality of the non-target wildlife specie's habitat through meeting that habitat's resource goals and objectives.

The creation of habitat for the mosquito *(Culex tarsalis)*, which is the carrier for West Nile virus (WNv), would be reduced through the implementation of water impoundment designed to minimize such habitats; and in the long-term reduce the potential of water impoundments contributing to WNv mortalities of avian species, including greater sage-grouse.

Control options for black-tailed prairie dogs, as outlined in the *Montana State Conservation Plan for Black-tailed and White-tailed Prairie Dogs*, would provide the mechanism to consider control proposals on BLM administered lands. If control options are authorized it is expected that there would be the elimination of individual species, but not the elimination of towns or colonies on BLM-administered lands.

TABLE 4-24.
BLM ADMINISTERED OIL AND GAS MINERAL ACRES OF WILDLIFE RESOURCES MAINTAINED, CONSERVED, AND AT RISK OF DEGRADATION FROM OIL AND GAS SURFACE DISTURBANCES

	Resource	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Resources Maintained (No Surface Occupancy Stipulation and not open for leasing)	Crucial Big Game Winter Range Habitat	-	1,191,000	-	-	-
	Sharp-tailed Grouse (lek sites)	42,000	-	-	-	-
	Colonial Nesting Waterbirds	160	270	-	-	270
	Bighorn Sheep Habitat	98,000	98,000	-	-	-
	Bald Eagle Habitat	1,850	1,850	1,850	1,850	1,850
	Raptor Nest Sites	50,000	179,000	-	-	51,903
	Black-Tailed Prairie Dog Habitat	-	297,000	127,000	-	-
	Piping Plover Habitat	7,000	7,000	-	-	7,000
	Interior Least Tern Habitat	11,000	11,000	-	-	11,000
	Pallid Sturgeon Habitat	500	15,000	15,000	-	10,000
	GRSG Sage-grouse General Habitat	11,000	-	-	-	61,000
	GRSG Sage-grouse Priority Habitat	29,000	1,329,000	-	-	1,329,000
	GRSG Sage-grouse Restoration Habitat	4,500	91,000	-	-	175,000
Resources Conserved (Controlled Surface Use/ Timing Limitation Stipulation)	Crucial Big Game Winter Range Habitat	1,191,000	-	1,191,000	1,191,000	1,191,000
	Sharp-tailed Grouse (lek sites and nesting habitat)	1,393,000	2,774,000	1,393,000	1,393,000	1,393,000
	Colonial Nesting Waterbirds	-	-	50	50	-
	Bighorn Sheep Habitat	-	-	98,000	98,000	98,000
	Bald Eagle Habitat	-	-	-	-	-
	Raptor Nest Sites	179,000	-	179,000	179,000	179,000
	Black-Tailed Prairie Dog Habitat	-	-	-	29,435	29,435
	Piping Plover Habitat	-	-	7,000	7,000	-
	Interior Least Tern Habitat	-	-	11,000	11,000	-
	Pallid Sturgeon Habitat	-	-		15,000	-
	GRSG Sage-grouse General Habitat	220,000	1,623,000	1,223,000	652,000	652,000
	GRSG Sage-grouse Priority Habitat	1,000,000	-	1,329,000	1,329,000	-
	GRSG Sage-grouse Restoration Habitat	140,000	19,000	198,000	-	22,000
Resources at Risk (Lease Terms)	Crucial Big Game Winter Range Habitat	-	-	-	-	-
	Sharp-tailed Grouse (lek sites and nesting habitat)	-	-	-	-	-
	Colonial Nesting Waterbirds	50	-	-	-	-
	Bighorn Sheep Habitat	-	-	-	-	-
	Bald Eagle Habitat	-	-	-	-	-
	Raptor Nest Sites	-	-	-	-	-
	Black-Tailed Prairie Dog Habitat	29,000	-	-	-	-
	Piping Plover Habitat	-	-	-	-	-
	Interior Least Tern habitat	-	-	-	-	-
	Pallid Sturgeon Habitat	9,500	-	-	-	-
	GRSG Sage-grouse General Habitat	-	-	-	-	-
	GRSG Sage-grouse Priority Habitat	-	-	-	-	-
	GRSG Sage-grouse Restoration Habitat	-	-	-	198,000	-

In the short-term, wildlife habitat fragmentation would occur as a result of implementing vegetation treatments (e.g., fuels management, etc.). Vegetative treatments would improve wildlife habitat in the long-term, since these treatments would reduce the intensity and severity of wildland fire or provide for control of invasive species in order to attain a desired vegetative community.

Resource use management actions resulting in reduced quality or quantity of surface and groundwater (e.g. drilling and hydraulic fracturing) would result in reduced aquatic wildlife habitat functionality.

Forested and woodland plant communities on BLM-administered lands would continue to provide wildlife habitat through the consideration of wildlife habitat values at the project level.

Meeting Rangeland Health Standards would maintain wildlife habitat functionality, as Standards for Riparian Functionality, Upland Health, and Wildlife Habitat for Native Wildlife and Plant Species promote diverse and resilient wildlife habitats. In addition, following and implementing the Guidelines for Livestock Management would conserve and protect wildlife habitat resources, as these guidelines provide management options to improve or maintain wildlife habitat functionality.

Resource management actions that maintain, conserve, or improve vegetation conditions; including managing for Proper Functioning Condition, riparian buffers, forest resilience, special status plant species, and range improvements would provide for maintenance or improvement of wildlife habitat.

Areas proposed for coal development would be evaluated for unsuitability when a lease application is received; and therefore provide for future protection, conservation or mitigation of wildlife habitat considered as unsuitable with or without exception.

Non-discretionary oil and gas development closures would eliminate oil and gas development as a threat to wildlife habitat on BLM administered oil and gas mineral estate.

Through the ability to immediately close roads or trails, the associated wildlife populations and habitats would be protected from impacts resulting from off-highway vehicle use.

Land tenure adjustments, as outlined in the *Lands and Realty – Renewable Energy Appendix*, would provide the opportunity to promote habitat manageability and connectivity.

ALTERNATIVE A (No Action)

Summary Statement

Surface disturbing activities are projected to result in approximately 75,000 acres of disturbance on BLM administered surface. From the total acreage above, 62,000 of these acres (including 15,000 acres associated with consumptive uses) would be reclaimed; therefore resulting in 13,000 acres of long-term disturbance.

Projected disturbance acreages include, but are not limited to, oil and gas development, coal mining, bentonite mining, and resource enhancement projects such as wildlife habitat projects, rangeland improvements, and prescribed fire. The reclaimed lands will not provide the same habitat conditions present prior to disturbance. This would be especially true in certain wildlife habitats, such as big sagebrush, which takes years to establish the same structure and diversity as undisturbed lands.

Wildlife habitat protective actions within this alternative focus on oil and gas activities. There are three suites of wildlife species where surface use limitations are applied to resources and resource use programs; including colonial nesting waterbirds, sharp-tailed grouse and greater sage-grouse. Protective measures for other resource projects or uses outside of oil and gas are analyzed and if appropriate, mitigated in site specific NEPA analysis.

Impacts to Fish, Aquatic and Wildlife Habitats, Including Special Status Species

Where management actions are applicable to all types of wildlife habitat and are not habitat or species specific, impacts are discussed in this section. Where specific impacts can be analyzed in greater detail, discussion will follow by habitat type. Management actions that impact all types of wildlife habitat that are discussed in further detail in this section includes livestock grazing, vegetation/fuels management, and OHV considerations.

For resource uses outside of the specific habitat types identified below or outside of the specific identified resource use identified below would be analyzed and mitigation applied at the project level for wildlife habitat (26,000 acres of disturbed BLM-administered lands). The application of the *Mitigation and Conservation Action Appendix*, as described in the common to all alternative would result in some degree of habitat fragmentation and/or the direct removal of vegetation on the acres above; and therefore would not provide previous habitat values or characteristics. However, the requirement of mitigation, and if necessary, compensation would result in the maintenance of wildlife habitat functionality in the long-term.

In relation to livestock grazing, Alternative A results in the same level of permitted livestock grazing authorized regardless of the amount of surface disturbing activities in areas of locatable mineral or oil and gas development, unless Standard for Rangeland Health are not met. This impacts wildlife habitat in the short-term as more forage would be removed by livestock from adjacent, undisturbed habitats, resulting in a decrease in cover for wildlife habitat and in some instances reduced functionality on approximately 7,400 BLM-administered acres in the long-term.

Also in relation to livestock grazing, authorizing grazing after deferment for one growing season following a wildfire or prescribed fire would facilitate vegetative reestablishment and therefore assist with restoring wildlife habitat only for that season of rest. But since this is just a time factor management action that does not consider specific plant species, climatic conditions, fire intensity, and ecological processes, there would be no measurable objectives to ensure the maintenance or conservation of wildlife habitat. Therefore, in the long-term it would be expected that the shrub component of the wildlife habitat would be reduced or eliminated within high intensity fire areas or low yearly precipitation events following the wildlife.

In relation to vegetation management, allowing fuels management on 310,000 acres and only on 53,000 acres (Condition Class 3) after commercial or pre-commercial timber harvest would limits BLM's ability to manage conifers in order to minimize catastrophic wildfire. As a result, wildland fire would remove important browse (e.g. shrubs) and thermal cover. Important habitats for species such as mule and whitetail deer, elk and wild turkeys would be at a greater risk of resource degradation due to catastrophic wildland fire within this alternative and habitats would be reduced or eliminated in area known for high-fire occurrence.

In addition to fuels management, vegetation management through the authorization of haying of public land to meet allotment objectives would result in the removal of cover aspect of wildlife habitat. This would primarily result decreased habitat values for avian species and cause temporary habitat fragmentation.

Lastly, open OHV use will result in a decrease in wildlife habitat functionality due to noise and surface disturbance on approximately 2,400 acres. OHV use would result in wildlife species avoiding the area, resulting in a reduced capacity of the area to support these species.

<u>Aquatic</u>

In consideration of oil and gas leasing activities, pallid sturgeon and other aquatic habitat is only managed through the inference of other resource stipulations (i.e. waterbodies, streams, and 100 year floodplains) and therefore only provide for assurance of maintaining the habitat when WEMS are not granted for the other resources. In addition, this alternative does not consider the connectivity aspect of aquatic habitat values, such as uplands around the habitat. In summary, this alternative does not provide for the conservation of the pallid sturgeon habitat, due to the lack of a management action directly associated with the species.

In specific to all aquatic habitats, the allowance water impoundments without identified conservation measures for aquatic habitat results in the alteration of the connectivity of hydrologic flows and food web dynamics, and

riparian vegetation recruitment and succession, which compromise or decrease aquatic wildlife habitat. This impact would be amplified if impoundments constructed on streams, which would limit dispersal and migration between habitats which are key life history strategies for prairie fishes and other aquatic wildlife. However, water impoundments would result in additional habitat for waterfowl and shorebirds, and water for terrestrial wildlife.

Surface disturbing activities resulting from riparian, watershed and aquatic wildlife habitat improvement projects would result in approximately 6,000 BLM-administered acres of short-term disturbance. Although there is a short-term removal and disturbance to aquatic wildlife habitat, there are also long-term improvements. These projects increase the connectivity and functionality for the aquatic wildlife habitat, providing for greater habitat quality and quantity for associated aquatic species.

Surface disturbing resource uses directly impacting aquatic habitat include development of springs (38 springs estimated to disturb 10 acres), installation of pits/reservoirs (estimated at 710 acres) and the placement of stock tanks within wetland and riparian areas. These disturbances would result in aquatic habitat fragmentation, decreasing the connectivity of the aquatic habitat due to reduction of the normal flow regime or loss of functionality due to no certainty of the conservation for the aquatic habitat.

Colonial Nesting Waterbirds

While this management action considers the direct impact of activities within the colonial nesting waterbird habitat, it does not address indirect impacts (e.g. noise) occurring adjacent to the 1,000 feet buffer, nor are oil and gas lease terms (60 timing/200 meter) adequate to ensure the conservation of the habitat. Therefore, habitat would not be maintained on 160 acres of BLM-administered lands and may result in nest abandonment and loss of localized populations.

Crucial Big Game Winter Range

The management of crucial big game winter ranges via a timing restriction of December 1 through March 31 for oil and gas development and geophysical exploration would provide crucial big game winter habitats and species conservation during the initial action year, but would not provide conservation of the habitat during the life of the disturbance. Impacts past the development stage, include but are not limited to noise, vehicle use, human presence, collisions with vehicles, and physical movement of structures and would contribute to a decline in functionality of the crucial big game winter ranges and reduction in populations associated with these habitats.

This disturbance and disruption also results in displacement of big game wildlife, altered movement patterns, and habitat fragmentation. The magnitude of this decline would depend on the rate and location of development. Through using the high development scenario for oil and gas development as a predictor for future activities, this would result in approximately 205,500 BLM-administered oil and gas acres of crucial big game winter range impacted to a level that suitable crucial big game winter range would decrease in functionality and associated populations would decrease following the development of these acres.

Other resource use activities proposed in crucial big game winter range habitat would be subject to mitigation identified in the site specific NEPA document. Mitigation measures would not provide certainty that functionality of crucial big game winter range would be maintained and therefore is no assurance that there would not be a decline in big game crucial winter range habitat on BLM-administered lands.

Sharp-tailed Grouse

The application of a timing restriction would not result in the conservation of the brood rearing, nesting, and winter habitat functionality for sharp-tailed grouse. While the breeding habitat would be maintained and conserved through the application of a 0.25 mile oil and gas NSO and restriction on other surface disturbing activities immediately surrounding the leks. The ability to maintain sharp-tailed grouse populations would be dependent on the scale and duration of surface disturbance outside of the 0.25 mile radius and changes to habitat on adjacent non-BLM administered lands. For example, protecting a 0.25 mile buffer around leks

would result in 80% of the habitat being available for surface disturbing activities. As the frequency of disturbance increases and the distance from the lek in which disturbance occurs decreases, reductions of populations would be expected to occur in areas of high development.

Through using the high development scenario for oil and gas development as a predictor for future activities, once development occurs, there would be no restrictions to operation and maintenance related activities, which would result in the reduction of brood rearing, nesting and winter habitat functionality (213,000 BLM administered oil and gas acres of sharp-tailed grouse nesting and brood rearing habitat). This would result in decreased survival in these areas. Conversely, 6,400 acres of BLM-administered oil and gas acres of breeding habitat surrounding sharp-tailed grouse leks would not be directly impacted by oil and gas development.

Other resource use activities proposed outside of the 0.25 mile restriction would be subject to mitigation identified in the site specific NEPA document. This would not ensure functionality sharp-tailed grouse habitat would be maintained, as important habitats exist beyond 0.25 miles of the leks.

Bighorn Sheep Habitat

Functionality of the big horn sheep habitat within the identified range would be maintained on 98,000 BLM-administered oil and gas acres with the application of an NSO stipulation. All other resource uses, including authorization of livestock grazing, would be mitigated on 68,000 acres of BLM-administered lands within the big horn sheep range during the project implementation stage and certainty of habitat maintenance is not known at this land use planning stage.

Black-Tailed Prairie Dogs

Outside of the black-footed ferret management action, there is no management actions defined for the conservation of black-tailed prairie dogs. As a result of utilization of lease terms associated with oil and gas (60 days/200 meters) and through using the high development scenario for oil and gas development as a predictor for future activities, this would result in approximately 3,900 acres of occupied habitat on BLM-administered lands available for the installation of infrastructure which would increase predation on prairie dogs and increased access for recreational shooting. However, if these surface disturbing activities reduced cover and increase bare ground, there would be an increase the ability of prairie dogs to expand into unoccupied habitat. All other resource uses, would be mitigated on BLM-administered lands within the black-tailed prairie dog habitat during the project implementation stage.

Black-Footed Ferrets

In relation to oil and gas development, alterative A does not consider the required size and scale of black-footed ferret habitat required for species reintroduction. In addition, the alternative provides a waiver that development may occur upon a survey that documents the absence of black-footed ferrets, which has historically always been granted due to the absence of the species. Therefore a CSU for oil and gas leasing within potential black-footed ferret habitat (black-tailed prairie dog colonies 80+ acres) would not conserve areas that may be considered as potential future reintroduction sites.

Special Status Raptor Species

The raptor species discussed in this section include bald eagles, ferruginous hawks, burrowing owl, golden eagle, Swainson’s hawk, and northern goshawk. Although there is a NSO stipulation for peregrine falcon nests within this alternative, there is no discussion on this subject since there are no known peregrine falcon nests within the planning area. All other resource uses, outside of oil and gas leasing, would be mitigated on BLM-administered lands within the special status raptor species habitat during the project implementation stage

Concerning oil and gas leasing in bald eagle habitat, the combination of the NSO stipulation for nests active in the past 7 years and within nesting habitat in riparian areas would maintain the functionality on approximately 3,000 acres of BLM-administered oil and gas mineral estate.

For ferruginous hawks, the two-year timeframe for the NSO stipulation for oil and gas leasing, would result in a decrease in nesting habitat for the ferruginous hawk species. This is because ferruginous hawk nests may be utilized inconsistently and not utilized for multiple years; depending on the condition of the nest, prey base, population fluctuations, and habitat conditions.

For burrowing owls, golden eagles, Swainson's hawk, and northern goshawk are protected via a timing limitation for oil and gas leasing the timing restriction only provides for a seasonal limitation and would result in a reduction of nesting and rearing habitat. In addition, the two-year timeframe is not adequate to maintain current nesting habitat since raptors are territorial, develop multiple nests within a small area, and rotate among the nests. The combination of both actions would decrease the amount of nesting habitat and preclude raptors from using nest sites in subsequent years. The result would be a reduction of raptors within the area of disturbance, which would not be mitigated by displaced raptors moving to other areas to nest.

Interior Least Terns

The NSO stipulation within 0.25 miles of interior least tern habitat provide for the conservation on 55,000 acres of BLM-administered oil and gas mineral estate from surface disturbing and disruptive activities and therefore not affect habitat or populations. All other resource uses, outside of oil and gas leasing, would be mitigated on BLM-administered lands within interior least tern habitat during the project implementation stage

Piping Plover

A NSO stipulation within 0.25 miles of wetlands identified as piping plover habitat would provide for the conservation on 4,000 acres of BLM-administered oil and gas mineral estate from surface disturbing and disruptive activities and therefore not affect habitat or populations. All other resource uses, outside of oil and gas leasing, would be mitigated on BLM-administered lands within the piping plover species habitat during the project implementation stage

Greater Sage-Grouse

Greater sage-grouse habitat is managed according to the two existing resource management plans. Management is focused on oil and gas leasing and development, with a common management action for other surface disturbing activities of a 0.25 mile NSO around lek sites and a March 1 through June 15 timing stipulation.

With the application of the 0.25 mile restriction on all surface disturbance around the lek, the breeding site would be conserved and maintained within this alternative, However, this results in approximately 80% of the greater sage-grouse habitat (422,000 acres of BLM administered high development potential oil and gas estate) available for development without major restrictions. It is expected that leks impacted by a surface disturbance, similar to that in the high development scenario for oil and gas, would result in the loss of leks at a rate of two to five times greater than leks outside areas of development. In addition, the estimated lek persistence (the ability of leks to remain on the landscape) would be approximately 5 percent, while lek persistence in areas outside this disturbance would average 85 percent. Of leks remaining within the disturbance, the number of males would decline by approximately 30-80 percent.

The above results are expected even with the consideration of the timing limitation within this alternative, because the timing limitation only provides for conservation during the initial nesting year of disturbance. Therefore it is expected that disturbance would lead to nesting and brood rearing habitat fragmentation and degradation and the associated population loss.

ALTERNATIVE B

Summary Statement

Alternative B is the most restrictive alternative in terms of not allowing surface disturbing activities. Approximately 80% of BLM-administered lands (approximately 2.1 million BLM-administered surface acres) would be closed to surface disturbing activities. Of the approximately 650,000 BLM-administered acres remaining, surface disturbance is estimated to occur on 36,000 acres, with 27,000 acres reclaimed, resulting in 6,000 acres of long-term disturbance.

Consistency in the treatment of surface disturbing or disruptive activities, regardless of the causal factor (e.g. oil and gas development, range improvements, ROWs, etc.) would occur. For example, in most instances when oil and gas leases would be issued with a NSO stipulation; non-oil and gas surface disturbing or disruptive activities are not allowed on BLM-administered lands.

Although providing the most restrictive management action in regards to wildlife habitats, this alternative prohibits projects benefitting wildlife habitat. This would prohibit future restoration projects (e.g. water, fuels management, vegetation) and therefore not benefit degraded wildlife habitat.

Impacts to Fish, Aquatic and Wildlife Habitats, Including Special Status Species

Where management actions are applicable to all types of wildlife habitat and are not habitat or species specific, impacts are discussed in this section. Where specific impacts can be analyzed in greater detail, discussion will follow by habitat type. Management actions that impact all types of wildlife habitat that are discussed in further detail in this section includes livestock grazing, vegetation/fuels management, and OHV considerations.

For resource uses outside of the specific habitat types identified below or outside of the specific identified resource use identified below would be analyzed and mitigation applied at the project level for wildlife habitat (17,000 acres of disturbed BLM-administered lands). The application of the *Mitigation and Conservation Action Appendix*, as described in the common to all alternative would result in some degree of habitat fragmentation and/or the direct removal of vegetation on the acres above; and therefore would not provide previous habitat values or characteristics. However, the requirement of mitigation, and if necessary, compensation would result in the maintenance of wildlife habitat functionality in the long-term.

For livestock grazing, the implementation of making grazing allotments unavailable when not meeting standards for rangeland heath would result in increased cover and wildlife habitat value in the short-term for non-disturbance associated wildlife species. However, in the long-term it is expected that wildlife habitat functionality would decrease due to decreased plant diversity and increased potential in wildfire severity.

Also, in relation to livestock grazing, the suspension of livestock grazing on BLM-administered lands impacted by the development of locatable mineral or oil and gas on BLM-administered lands (estimated 6,200 BLM-administered acres) would maintain the cover and reduce the herbivory on associated adjoining habitats. The alternative does not contain specificity on how or when grazing would be re-activated and therefore does not ensure that wildlife habitat would be considered in the process in the authorization of livestock grazing.

Finally in relation to livestock grazing, the suspension of livestock grazing for at least two growing seasons following prescribed or wildland fires, or vegetative treatments would provide a short-term benefit to wildlife habitats through increased cover, available browse, and habitat vigor. However this management action just provides a time consideration, and does not provide any certainty for the variation in climate, precipitation, and wildland fire severity; therefore it does not provide for the conservation of wildlife habitat.

In relation to fuels management there would be an increased potential for wildlife habitat degradation due not allowing to the activity; and therefore resulting increased wildland fire severity in some areas of the field office. Fuel treatments where allowed, would result in either more open forested conditions, which would improve the habitat for species selecting these habitats, or decreased encroachment of juniper and pine species, which would

improve habitats for greater sage-grouse and other sagebrush-dependent species. Short-term impacts from any vegetation treatment would temporarily displace wildlife. Habitats would change immediately after treatments and then gradually evolve over time.

In addition to fuels management as a vegetation management action, vegetation management through the authorization of haying of public land only to meet fuels management objectives would result in the removal of cover aspect of wildlife habitat. This would primarily result decreased habitat values for avian species and cause temporary habitat fragmentation.

Lastly, approximately 64,000 acres of wildlife habitat would be improved or maintained through the closure to OHV use and limiting travel to existing roads and trails. In specific, this would reduce wildlife habitat fragmentation and improve wildlife habitat conditions on 2,400 acres of BLM-administered lands, which are managed as an open OHV area in Alternative A. In the long-term it would be expected that habitat conditions would improve over time to a point that historical wildlife species and wildlife carrying capacities would return to the area.

Aquatic

In relation to pallid sturgeon this alternative results in approximately 15,000 acres of BLM administered oil and gas mineral estate and 4,000 acres of BLM administered lands conserved through the application of a non-discretionary buffer. When compared to Alternative A, the 0.5 mile size of the buffer increases that conservation measures by approximately 4,000 acres of BLM-administered lands and 14,500 acres of BLM-administered oil and gas mineral estate, because it proactively manages the interaction the habitat with the adjacent uplands. This would provide greater assurance that pallid habitat would be maintained and functionality would remain when compared to Alternative A.

Differing from Alternative A, all surface-disturbing activities within Alternative B would have to benefit the functionality of 100-year floodplains of major stream and rivers, wetlands, riparian areas, waterbodies and streams; and therefore would maintain and conserve aquatic habitat because there is an intrinsic connection between these areas and aquatic habitat. In addition, the application of the buffer for riparian and wetland would ensure adjacent uplands maintain and conserve aquatic habitat on BLM administered lands through the reduction of erosion and sedimentation, bank instability, habitat fragmentation, and displacement of some aquatic wildlife.

Also differing from Alternative A, by not allowing water impoundments in Alternative B the current natural flow regime would provide for the maintenance of the existing aquatic habitat dependent on overland flow. This would maintain dispersal and migration between habitats, which are key life history strategies for prairie fishes and other aquatic wildlife. However, limiting water impoundments would result in decreased habitat for waterfowl and shorebirds, and water for terrestrial wildlife.

Surface disturbing activities resulting from riparian, watershed and aquatic wildlife habitat improvement projects would result in approximately 2,800 BLM-administered acres of short-term disturbance. This would result in the same type of short and long-term impacts as described in alternative A; however this is approximately a 50% reduction in acres of projects that would benefit aquatic wildlife habitat when compared to Alternative A.

Surface disturbing resource uses directly impacting aquatic habitat include development of springs (8 springs estimated to disturb 2 acres). This disturbance would result in short-term aquatic habitat fragmentation, decreasing the connectivity of the aquatic habitat due to reduction of the normal flow regime or loss of functionality due to the disturbance. In the long-term, the design as of the spring developments would have to benefit the features associated with aquatic habitat (e.g. floodplains) and therefore not have any long-term impacts to the habitat type.

Colonial Nesting Waterbirds

Within this alternative, the potential impacts related to oil and gas development is not present within or around colonial nesting waterbirds habitat, since the 270 acres of BLM administered oil and gas mineral estate is closed to leasing. All other surface disturbing activity would result in the minimization of impacts on 250 acres of BLM-administered lands around or within colonial nesting waterbird habitat. When compared to Alternative A, this increases the level of conservation for the species through the consideration of other surface disturbing activities and in the consideration of indirect impacts that could result in the degradation of the occupied habitat.

Big Game Crucial Winter Range

The management of crucial big game habitat via a NSO (1.2 million acres of BLM-administered oil and gas mineral estate) and not allowing surface disturbing or disruptive activities (760,000 acres of BLM-administered lands), eliminates anthropogenic threats to functionality of this habitat. Therefore the current habitat functionality (e.g. plant diversity, thermal cover, browse availability, etc.) would be conserved and maintained in relation to anthropogenic caused disturbances. However, as a result of not having the capability to initiate habitat improvement projects within a majority of the crucial big game winter range functionality on 760,000 acres of BLM-administered lands would be placed at a greater risk of degradation or loss when compared to Alternative A.

Areas of crucial big game winter range (approximately 20,000 BLM-administered surface acres) managed for lands with wilderness characteristics (Rough, Ridge, Whitetail, Wrangler). In some instances the protection of the wilderness characteristics are compatible with crucial big game winter range habitat goals of limiting anthropogenic disturbances. However, protection of wilderness characteristics would degrade crucial big game winter habitat value due to the limitations (e.g. design, increased economic cost, etc.) or inability to implement vegetation management activities (e.g. fuels reduction and forestry treatments) to reduce wildfire severity and improve browse availability. This would result in long-term decreased functionality of the above big game crucial winter range habitat and the associated use by big game. The influence of this gradation would be especially prevalent within the Wrangler and Rough Lands with Wilderness Characteristic areas, since approximately 22% of the big game crucial big game winter range surrounding these two areas have been degraded or eliminated due to severe wildfire events. The current degradation to crucial big game winter range habitat has resulted in a decrease in mule deer populations in the vicinity of the subject areas and not proactively implementing improvement projects would result in a continuation of the risk for the further decrease in populations.

Sharp-tailed Grouse

The nesting and brood rearing habitat for sharp tailed grouse would be conserved on 1.5 million BLM-administered surface acres and 3.5 million acres of BLM administered oil and gas mineral estate. Therefore, the existing sharp-tailed grouse habitat functionality (e.g. plant diversity, cover, etc.) would be maintained in relation to anthropogenic caused disturbances. When compared to Alternative A, this alternative provides for no specific conservation actions for the breeding habitat (21,000 BLM-administered surface acres and 42,000 acres of BLM administered oil and gas mineral estate. However, when compared to A the alternative provides for greater than a million acres being conserved due to the elimination of the timing limitation adverse impacts discussed in Alternative A. It would be expected that habitat conditions on BLM-administered lands would remain static.

Bighorn Sheep

In relation to oil and gas development there would be same impact has described in alternative A. The primary difference in this alternative is the inclusion of not allowing other surface disturbing activities, which would maintain the current status of the habitat in relation to other anthropogenic caused disturbances. This would result in an additional conservation measure and continued maintenance of habitat characteristics for 70,000 acres of BLM-administered lands when compared to Alternative A. However, as a result of not having the capability to initiate habitat improvement projects within a majority of the big horn sheep habitat range

functionality on 70,000 acres of BLM-administered lands would be placed at a greater risk of degradation or loss from catastrophic events (e.g. wildfire) when compared to Alternative A.

In addition, the elimination of domestic sheep or goat grazing on BLM administered lands within 14.3 miles of the bighorn sheep range would reduce the potential for contact between bighorn sheep and domestic sheep or goats on 400,000 BLM-administered surface acres. This would result in a reduction in potential epizootic disease events from BLM grazing authorizations; however BLM controls a limited portion of this area and therefore this restriction may not be effective due to the lack of management control.

Black-Tailed Prairie Dogs

Alternative B not only provide for the conservation of known occupied habitat (11,000 acres of BLM-administered lands and 29,000 acres of BLM-administered oil and gas mineral estate) but also provides an additional buffer that would include an additional 139,000 acres of BLM-administered lands and 268,000 acres of BLM-administered oil and gas mineral estate. This would result in the elimination of direct and indirect habitat destruction, altered wildlife movement patterns, and displacement from BLM authorized actions on the above additional lands when compared to Alternative A. Unless influenced by other factors outside of the control of the BLM, it is expected habitat conditions would remain static on the above BLM-administered lands.

Special Status Raptor Species

The raptor species discussed in this section include bald eagles, ferruginous hawks, burrowing owl, golden eagle, Swainson's hawk, and northern goshawk. In contrast to Alternative A, all resource uses, including oil and gas development, would be considered and have to maintain the functionality of the specific special status species habitat within various timelines discussed below.

For bald eagles, the 0.5 mile buffer from active nests in the past 5 years would provide for the conservation of the bald eagle habitat and eliminate BLM authorized anthropogenic disturbances as a threat within the identified area (2,000 acres of BLM-administered land and 2,000 acres of BLM-administered oil and gas estate). The size of the buffer and the timing consideration for this species considers nest rotation habits and ensures functional habitat is present for bald eagles. Although this reduces the amount of time (7 years vs. 5 years) when compared to the oil and gas leading stipulation in Alternative A, there is no expected decrease in habitat quality or quantity since nest are typically used with a 5 year timeframe.

For the other sensitive status raptor species (burrowing owl, golden eagle Ferruginous hawk, Swainson's hawk, prairie falcon and northern goshawk) this alternative also provides for the conservation of the species habitat through the elimination of BLM authorized anthropogenic disturbances as a threat within 0.5 miles of nest sites active within the past seven years. The size of the buffer and the timing consideration for the above suite of species considers nest rotation habits and ensures functional habitat is present for the species (110, 000 acres of BLM-administered lands and 179,000 acres of BLM-administered oil and gas mineral estate). The timeframe consideration of 7 years in Alternative B vs 2 years in Alternative A, will ensure Alternative B provides for the continued functionality of the species' nesting habitat by consideration of nest rotation over many years.

Interior Least Tern

In relation to oil and gas development there would be same impact has described in alternative A. The primary difference in this alternative is the inclusion of not allowing other surface disturbing activities, which would maintain the current status of the habitat in relation to other anthropogenic caused disturbances. This would result in an additional conservation measure and continued maintenance of habitat characteristics for 10,000 acres of BLM-administered lands when compared to Alternative A.

Recreational use of the graveled islands in the rivers during late spring through mid-August could impact nesting least terns. It is not uncommon for interior least terns to nest on graveled islands well into July and

August. Use of islands by recreationists could result in trampling of eggs or in disturbance of adults incubating eggs. The extent of this use is not well known.

Piping Plover

In relation to oil and gas development there would be same impact has described in alternative A. The primary difference in this alternative is the inclusion of not allowing other surface disturbing activities, which would maintain the current status of the habitat in relation to other anthropogenic caused disturbances. This would result in an additional conservation measure and continued maintenance of habitat characteristics for 4,000 acres of BLM-administered lands when compared to Alternative A.

Recreational use of the graveled islands within the Missouri River could impact nesting piping plovers. Use of islands by recreationists could result in trampling of eggs or in disturbance of adults incubating eggs. The extent of this use is not well known.

Greater Sage-Grouse

The greater sage-grouse management areas (general, priority, and restoration) are consistent for Alternatives B through E. However, different management is identified in each management areas.

General Habitat Management Areas

The consideration of greater sage-grouse habitat functionality in relation to all surface disturbing activities, including oil and gas development, within 4 miles of a lek would conserve 861,000 acres of BLM-administered lands and 1,623,000 acres of BLM-administered oil and gas mineral estate. In relation greater sage-grouse improvement opportunities, this alternative provides the least amount of opportunity for habitat improvement projects to benefit greater sage grouse.

In comparison to Alternative A, this management action provides for a much larger area of conservation for greater sage-grouse. For example, Alternative A leaves much of the general habitat available for anthropogenic disturbances without specific conservation measures for greater sage-grouse (i.e. 11,000 BLM-administered oil and gas mineral estate with a NSO). Whereas, Alternative B has 1,612,000 BLM-administered oil and gas mineral estate more acres within a CSU stipulation when compared to A. It is expected that the acreage increase of 4 mile radius in this management action would provide for greater sage-grouse habitat maintenance (breeding, nesting, and brood rearing) and connectivity on BLM-administered lands. However, the exact detail is unknown since site specific habitat quantity and quality on the above acres are unknown.

Priority Habitat Management Areas

Priority areas (817,000 acres of BLM administered lands areas and 1,395,000 acres of BLM administered mineral estate) are protected from surface disturbing or disruptive activities. This would eliminate the threat of anthropogenic disturbances and therefore the threat to the greater sage-grouse habitat functionality as these activities would be eliminated on BLM-administered lands and mineral estate. Greater sage-grouse habitat quality and quantity would be dependent on other processes of nature (e.g. fire, drought, flood, etc.) However, habitat improvement projects including those which assist in meeting objectives for those areas would not be implemented by the BLM on the above lands. Where habitat opportunities exist, this would result in the short and long-term degradation of greater sage-grouse habitat.

In comparison to Alternative A, this management action provides for a much larger area of protection for greater sage-grouse though the elimination of anthropogenic activities. Depending on other factors (e.g. fire, climate change, etc.), it is expected that this elimination would provide for greater sage-grouse habitat maintenance and connectivity on BLM-administered lands. However, the exact detail is unknown since site specific habitat quantity and quality on the above acres are unknown

Two areas of lands with wilderness characteristics (Ridge and Whitetail) would receive priority for the protection or enhancement of those characteristics rather than the management of the area for priority greater

sage-grouse habitat. In some instances the protection of the wilderness characteristics are compatible with priority greater sage-grouse habitat management areas goals of limiting anthropogenic disturbances. However, both of the above lands with wilderness characteristics contain juniper and ponderosa pine that are encroaching into greater sage-grouse priority areas. The ability to treat this encroachment would be reduced or eliminated within these areas under this alternative. In addition, the ability to proactively manage the areas specifically for greater sage-grouse would also be limited in nature (e.g. placement of fence reflectors to reduce collisions).

Restoration Management Areas

Areas with limited disturbance (i.e. areas containing 3 or fewer wells within 1 miles of lek) would maintain the current functionality of the greater sage-grouse habitat (40,000 acres of BLM-administered lands and 91,000 acres of BLM-administered oil and gas mineral estate). However, since these areas are already highly fragmented greater sage-grouse habitat functionality on the landscape scale would be static and expected to decline due to development outside of the area (46,000 acres of BLM-administered lands and 101,000 acres of BLM-administered oil and gas mineral estate).

Habitat Compensation

Habitat compensation is applicable to all greater sage-grouse areas. Habitat compensation would provide incentives for proponents to avoid greater sage-grouse habitat and require compensation for lost habitat. Requiring proponents to compensate at a 1:1 ratio in General Habitat Areas and a 5:1 ratio in the Priority ACEC and Restoration Areas would deter development of undisturbed habitat; or if disturbing habitat was unavoidable, minimize the amount of disturbance. Because development for discretionary locations would be steered to the non- Priority and non-Restoration Areas, these actions would encourage providing replacement habitat or otherwise protecting habitat from future development. A 5:1 compensation ratio would protect more habitat than was lost and assure suitable habitat for greater sage-grouse would be provided in the area.

ALTERNATIVE C

Summary Statement

Surface disturbance is estimated to impact 73,000 BLM administered acres, with 62,000 acres reclaimed, resulting in 11,000 acres of long-term disturbance. This includes disturbance from projects such as oil and gas development, coal and wildlife habitat improvement projects, range improvements, prescribed fire and other surface disturbing activities. Of this, 47,500 acres are associated with projects benefitting the resource (e.g. habitat improvement projects) and 25,500 acres is related to consumptive uses (e.g. mining, oil and gas development, etc.). Improvement or restoration projects have no long-term associate disturbance. Resource improvement projects would be implemented and wildlife habitat improved or restored on 1,000 acres less than in Alternative A.

Wildlife habitat management actions are focused on more than oil and gas related activities and take into consideration other surface disturbing or disruptive activities, including resource benefit and consumptive resource use projects. Management focuses on assuring habitats are managed and conservation actions are implemented regardless of the causal surface disturbance or disruptive activity.

Impacts to Fish, Aquatic and Wildlife Habitats, Including Special Status Species

Where management actions are applicable to all types of wildlife habitat and are not habitat or species specific, impacts are discussed in this section. Where specific impacts can be analyzed in greater detail, discussion will follow by habitat type. Management actions that impact all types of wildlife habitat that are discussed in further detail in this section includes livestock grazing, vegetation/fuels management, and OHV considerations.

For resource uses outside of the specific habitat types identified below or outside of the specific identified resource use identified below would be analyzed and mitigation applied at the project level for wildlife habitat (26,000 acres of disturbed BLM-administered lands). The application of the *Mitigation and Conservation Action Appendix*, as described in the common to all alternative would result in some degree of

habitat fragmentation and/or the direct removal of vegetation on the acres above; and therefore would not provide previous habitat values or characteristics. However, the requirement of mitigation, and if necessary, compensation would result in the maintenance of wildlife habitat functionality in the long-term.

For livestock grazing, the implementation of making grazing allotments unavailable when not meeting standards for rangeland heath would result in increased cover and wildlife habitat value in the short-term for non-disturbance associated wildlife species. In addition, in the long-term it is expected that wildlife habitat functionality would be maintained and conserved due to allowing livestock grazing after a period of rest has allowed wildlife habitats to recover and stabilize.

Also in relation to livestock grazing, the suspension of livestock grazing on BLM-administered lands impacted by the development of locatable mineral or oil and gas on BLM-administered lands (estimated 7,500 BLM-administered acres) would maintain the cover and reduce the herbivory on associated adjoining habitats. The alternative does contain specificity on how livestock grazing would be re-activated (i.e. Standards for Rangeland Health) and since these Standards specifically include wildlife habitat consideration, long-term wildlife habitat functionality would be maintained if and when livestock grazing is authorized.

Finally in relation to livestock grazing, the suspension of livestock grazing until vegetative objectives are met following prescribed or wildland fires, or vegetative treatments would provide a short-term and long benefit to wildlife habitats through increased cover, available browse, and habitat vigor. However this management action does not contain prescriptions specifically addressing wildlife habitat values, and therefore does not provide certainty these values would be considered in the authorization process.

In relation to fuels management, where allowed this activity would result in either more open forested conditions, which would improve the habitat for species selecting these habitats, or decreased encroachment of juniper and pine species, which would improve habitats for greater sage-grouse and other sagebrush-dependent species. Short-term impacts from any vegetation treatment would temporarily displace wildlife. Habitats would change immediately after treatments and then gradually evolve over time to provide for desirable wildlife habitat.

In addition to fuels management as a vegetation management action, vegetation management through the authorization of haying of public land only to meet allotment management objectives would result in the removal of cover aspect of wildlife habitat. This would primarily result decreased habitat values for avian species and cause temporary habitat fragmentation.

Lastly, approximately 640 acres of wildlife habitat would be continued to be managed as on open OHV area and have the same adverse impacts as described in Alterative A. However, this alternative would reduce wildlife habitat fragmentation and improve wildlife habitat conditions on 1,760 acres of BLM-administered lands by closing these acres to open OHV use. In the long-term it would be expected that on the closed areas habitat conditions would improve over time to a point that historical wildlife species and wildlife carrying capacities would return to the area.

Aquatics

In relation to pallid sturgeon habitat and impacts concerning the functionality of aquatic habitat in floodplains and riparian areas, please refer to alternative B as the management actions are identical. Discussion below focuses on aquatic habitat impacts in relation to impoundments.

This alternative provides for the maintenance of the current natural flow regime and watershed functionality; and therefore would conserve and maintain the existing aquatic habitat dependent on overland flow. This would maintain dispersal and migration between habitats, which are key life history strategies for prairie fishes and other aquatic wildlife. However, the alternative does not address sedimentation, which would lead to the degradation of aquatic habitats.

Surface disturbing activities resulting from riparian, watershed and aquatic wildlife habitat improvement projects would result in approximately 5,700 BLM-administered acres of short-term disturbance. This would

result in the same type of short and long-term impacts as described in Alternative A as the estimated acres are the same. Conversely, this is approximately a 50% increase in acres of projects that would benefit aquatic wildlife habitat when compared to Alternative B.

Surface disturbing resource uses directly impacting aquatic habitat include development of springs (8 springs estimated to disturb 2 acres) and installation of pits/reservoirs (estimated at 530 acres). This disturbance would result in short-term aquatic habitat fragmentation, decreasing the connectivity of the aquatic habitat due to reduction of the normal flow regime or loss of functionality due to the disturbance. In the long-term, the design as of the spring developments would have to benefit the features associated with aquatic habitat (e.g. floodplains) and therefore not have any long-term impacts to the habitat type.

Colonial Nesting Waterbirds

Within this alternative, the direct potential impacts related to oil and gas development and other surface disturbing activities is not present within colonial nesting waterbirds habitat (10 acres of BLM administered lands and 50 acres of BLM-administered oil and gas estate). However this alternative does not consider the indirect impacts (e.g. noise) outside of the occupied habitat and therefore there would reduce the functionality and potential occupation of the above acres. In addition, there is greater potential for nest abandonment and permanent loss of habitat within the above acres.

When compared to Alternative A, this increase the level of conservation for the species through the consideration of other surface disturbing activities; however when compared to Alternative B, this provides less conservation of habitat since indirect impacts occurring immediately outside the areas are not considered within this Alternative C.

Big Game

The management of crucial big game habitat with a CSU stipulation for oil and gas development (1.2 million acres of BLM-administered oil and gas mineral estate) and though providing other surface disturbing or disruptive activities (760,000 acres of BLM-administered lands) have to maintain the functionality of the habitat, ensures the conservation and continued functionality of this habitat. Therefore the current habitat functionality (e.g. plant diversity, thermal cover, browse availability, etc.) would be conserved and maintained in relation to all BLM authorized anthropogenic caused disturbances. This level of conservation is much greater and provides more certainty when compared to just the timing limitation in Alternative A. In relation to Alterative B, the same type of expected impacts to big game crucial winter range is expected to occur within this alternative.

This management action also provides the capability to initiate habitat improvement projects within crucial big game winter range (760,000 acres of BLM-administered lands, including 20,000 acres of lands with wilderness characteristics) and would ensure that the habitat values would be enhanced or managed to reduce the threat of the loss of highly important thermal covers in the case of wildlife events. This would result in long-term maintenance or improvement to the functionality of the above big game crucial winter range habitat and the associated use by big game.

Sharp-Tailed Grouse

The nesting and brood rearing habitat for sharp tailed grouse would be conserved on 800,000 acres of BLM-administered surface acres and 1.4 million acres of BLM administered oil and gas mineral estate. Therefore, the existing sharp-tailed grouse habitat functionality (e.g. plant diversity, cover, etc.) would be maintained in relation to anthropogenic caused disturbances. This would also include the continued conservation of sharp-tailed grouse breeding habitat (21,000 BLM-administered surface acres and 42,000 acres of BLM administered oil and gas mineral estate). This management action would assure functional habitats needed to maintain viable populations of sharp-tailed grouse at the landscape level.

Bighorn Sheep

In relation to oil and gas development there would be same impact has described in Alternative A. The primary difference in this alternative is the inclusion of allowing other surface disturbing activities that maintained the big horn sheep habitat, which in totality would maintain the current status of the habitat in relation to anthropogenic caused disturbances. This would result in an additional conservation measure and continued maintenance of habitat characteristics for 70,000 acres of BLM-administered lands when compared to Alternative A. In addition, this alternative provides the capability to initiate habitat improvement projects to improve the functionality on BLM-administered lands.

The authorization process for domestic sheep or goat grazing permits within 14.3 miles of the bighorn sheep range and where BLM controls more than half the land in a pasture would reduce the potential for contact between bighorn sheep and domestic sheep or goats on 400,000 BLM administered surface acres. This would result in a reduction in potential epizootic disease events from BLM grazing authorizations; however BLM controls a limited portion of this area and therefore this restriction may not be effective due to the lack of management control.

Black-Tailed Prairie Dogs

Alternative C not only provides for the conservation of known occupied habitat (11,000 acres of BLM-administered lands and 29,000 acres of BLM-administered oil and gas mineral estate) but also provides an additional buffer that would include an additional 70,000 acres of BLM-administered lands and 102,000 acres of BLM-administered oil and gas mineral estate. This would result in the elimination of direct and indirect habitat destruction, altered wildlife movement patterns, and displacement from BLM authorized actions on the above additional lands when compared to Alternative A.

Although this is fewer acres than Alternative B, it is expected that habitat conditions would be maintained on BLM administered lands in a manner that would ensure anthropogenic activities would not be a contributing factor to cause of elimination of the colonies/towns or decline in habitat conditions. This management action does not preclude the implementation of habitat enhancement projects and therefore provides for the long-term conservation or maintenance of the habitat.

Special Status Raptor Species

The raptor species discussed in this section include bald eagles, ferruginous hawks, burrowing owl, golden eagle, Swainson's hawk, and northern goshawk. For bald eagle impact discussions please refer to Alternative B as the management action is identical. In contrast to Alternative A, all resource uses, including oil and gas development, would have to maintain the functionality of the specific special status raptor species habitat within various timelines contained in this management action. Therefore, impacts to the above special status raptor species from oil and gas development and other surface disturbing activities would be the same as in Alternative B.

Interior Least Tern

In contrast to Alternative A, all resource uses, including oil and gas development, would have to maintain the functionality of the interior least tern habitat. Therefore, the direct and indirect impacts to the interior least tern habitat from oil and gas development and other surface disturbing activities would be the same as in Alternative B, because the same net effect of maintaining or conserving the interior least tern habitat is realized with the application of WEMs.

Piping Plover

In contrast to Alternative A, all resource uses, including oil and gas development, would have to maintain the functionality of the piping plover habitat. Therefore, the direct and indirect impacts to the piping plover habitat from oil and gas development and other surface disturbing activities would be the same as in Alternative B.

Greater Sage-Grouse

The same greater sage-grouse management areas (general, priority, and restoration) are consistent for Alternatives B through E. However, different management is identified in each management areas.

General Habitat Management Areas

Alternative C would have the same types of impacts for greater sage-grouse as in Alternative B. The differences are that area of the conservation measure in the alternative has been reduced from 4 miles to 3.1 miles around leks and that habitat improvement projects would be allowed in the area. The consideration of greater sage-grouse habitat functionality in relation to all surface disturbing activities, including oil and gas development, within 3.1 miles of a lek would conserve 642,000 acres of BLM-administered lands and 1,223,000 acres of BLM-administered oil and gas mineral estate.

In comparison to Alternative A, this management action provides for a much larger area of conservation for greater sage-grouse. For example, Alternative A leaves much of the general habitat available for anthropogenic disturbances without specific conservation measures for greater sage-grouse. Whereas, Alternative C has 1,212,000 BLM-administered oil and gas mineral estate more acres conserved with a CSU stipulation when compared to Alternative A. Although this is less acres than provided in the Alternative B, it is expected that the acreage increase of 3.1 mile radius in this management action would provide for greater sage-grouse habitat maintenance (breeding, nesting, and brood rearing) and connectivity on BLM-administered lands. Additionally and based on research in Southeast Montana, it is expected that approximately 88% of the nesting population would be captured with a 3.1 mile buffer area. However, the exact detail is unknown since site specific habitat quantity and quality on the above acres are unknown.

Priority Management Areas

Surface disturbing or disruptive activities (including oil and gas development) would be implemented in sagebrush habitat in a manner that provides for the conservation of the sagebrush habitat through limiting direct disturbance to sagebrush habitats for greater sage-grouse (1 per 640 acres) and through a cap on the amount of disturbance 3% (19.2 acres per 640 acres) on 817,000 acres of BLM administered lands and 1,329,000 acres of BLM administered oil and gas mineral estate. While this provides for the conservation of sagebrush habitats, it does not provide for the conservation of all habitats required at a landscape scale for greater sage grouse. For example, highly important brood rearing habitat often associated with Mesic areas would not be identified; therefore resulting in susceptibility of the area to anthropogenic disturbances without specific measures for the proactive management for greater sage-sage grouse. Additionally, this management action does not take into account indirect impacts, which although hard to ascertain, would result in the degradation of greater sage-grouse habitat.

In comparison to Alternative A, this management action provides for a much larger area of conservation for greater sage-grouse though providing a cap on anthropogenic activities. However, similar to Alternative A, Alternative C would not provide for greater sage-grouse connectivity considerations on BLM-administered lands. While the exact detail is unknown, since site specific habitat quantity and quality on the above acres are unknown, there would be an expected decline in available greater sage-grouse habitat at a landscape scale.

Restoration Habitat Management Areas

Within these areas it is expected that greater sage-grouse habitat conditions on 86,000 acres of BLM administered lands and 198,000 acres of BLM administered oil and gas mineral estate, would be unchanged from the current status, since habitat functionality would have to be a maintained within this alternative. However, the functionality of this habitat, does not guarantee occupation by greater sage-grouse due to current direct and indirect impacts of the existing disturbances (i.e. oil and gas development, locatable mineral development, and coal mining).

Habitat Compensation

Habitat compensation is applicable to all greater sage-grouse areas. Habitat compensation would provide an incentive for proponents to avoid greater sage-grouse habitat and require compensation for lost habitat. Requiring proponents to compensate at a 1:1 ratio in General Habitat Areas and a 5:1 ratio in the Priority and Restoration Areas would deter development of undisturbed habitat; or if disturbing habitat was unavoidable, minimize the amount of disturbance. Because development for discretionary locations would be steered to the non- Priority and non-Restoration Areas, these actions would encourage providing replacement habitat or otherwise protecting habitat from future development. A 5:1 compensation ratio would protect more habitat than was lost and assure habitat for greater sage-grouse would be provided.

ALTERNATIVE D

Summary Statement

Alternative D allows for surface disturbing and disruptive activities. A requirement for maintenance of habitat functionality is a part of some management actions and absent in other management action. This alternative generally protects the least acres and mandates the least restrictive stipulations, as compared to Alternatives B and C, but more protection than Alternative A.

Surface disturbance is estimated to impact 80,000 BLM-administered acres, with 67,000 acres reclaimed, resulting in 12,000 acres of long-term disturbance. This includes disturbance from projects such as oil and gas development, coal, habitat enhancement projects, range improvements, prescribed fire and others. Of this surface disturbance, 47,500 acres are associated with projects benefitting the resource (e.g. habitat improvement projects) and 25,500 acres are associated with consumptive uses (e.g. mining, oil and gas development, etc.). The improvement or restoration projects would have no long-term associate disturbance on wildlife habitat.

Alternative D closely resembles Alternative C in relation to management actions and impact analysis. The different management actions existing in authorization of livestock grazing in big sheep range; years of application in consideration active nest determination for raptors; no buffer for black-tailed prairie dog habitat; in the management of pallid sturgeon habitat; and in the management of greater sage-grouse general, priority, and restoration habitat management areas.

Impacts to Fish, Aquatic and Wildlife Habitats, Including Special Status Species

Where management actions are applicable to all types of wildlife habitat and are not habitat or species specific, impacts are discussed in this section. Where specific impacts can be analyzed in greater detail, discussion will follow by habitat type. Management actions that impact all types of wildlife habitat that are discussed in further detail in this section includes livestock grazing, vegetation/fuels management, and OHV considerations.

For resource uses outside of the specific habitat types identified below or outside of the specific identified resource use identified below would be analyzed and mitigation applied at the project level for wildlife habitat (32,000 acres of disturbed BLM-administered lands). The application of the *Mitigation and Conservation Action Appendix*, as described in the common to all alternative would result in some degree of habitat fragmentation and/or the direct removal of vegetation on the acres above; and therefore would not provide previous habitat values or characteristics. However, the requirement of mitigation, and if necessary, compensation would result in the maintenance of wildlife habitat functionality in the long-term.

For the management actions concerning livestock grazing, the implementation of suspending use on allotments when not meeting standards for rangeland heath and the suspension of grazing use in areas of oil and gas and locatable mining are the same as in Alternative C; therefore please refer to Alternative C for discussion on these action. There is a difference in how grazing would be authorized following wildlife, fuels, or non-fire vegetative treatment.

In relation to the authorization of livestock grazing following a wildland, fuels, or non-fire vegetation treatment, the suspension of livestock grazing until Standards for Rangeland Health are met would provide

increased cover, available browse, and habitat vigor in both the short and long-term. In addition, this management action specifically addresses wildlife habitat values through the application of Standards for Rangeland Health, and therefore does provide certainty these values would be considered in the authorization process.

In addition to fuels management as a vegetation management action, vegetation management through the authorization of haying of public land only to meet allotment management objectives would result in the removal of cover aspect of wildlife habitat. This would primarily result decreased habitat values for avian species and cause temporary habitat fragmentation.

Lastly, approximately 1,975 acres of wildlife habitat would be continued to be managed as on open OHV area and have the same adverse impacts as described in Alterative A. However, this alternative would reduce wildlife habitat fragmentation and improve wildlife habitat conditions on 425 acres of BLM-administered lands by closing these acres to open OHV use. In the long-term it would be expected that on the closed areas habitat conditions would improve over time to a point that historical wildlife species and wildlife carrying capacities would return to the area.

Aquatics

In relation to discussions concerning the functionality of aquatic habitat in relation to waterbodies, 100 year floodplains, impoundments, and riparian or riparian areas, please refer to Alternative C as management actions are identical. Discussion below focuses on the different management action of pallid sturgeon.

In relation to pallid sturgeon this alternative results in approximately 15,000 acres of BLM administered oil and gas mineral estate and 4000 acres of BLM administered lands conserved through the application of a non-discretionary buffer and a prescription that activities would have to maintain habitat functionality. When compared to Alternative A, the 0.5 mile size of the buffer increases that conservation measures by approximately 14,500 of BLM administered oil and gas mineral estate, because it proactively manages the interaction the habitat with the adjacent uplands. This would provide greater assurance that pallid habitat would be maintained and functionality would remain when compared to Alternative A. In comparison to Alternative B and C, this management action has the same habitat impact, but provides lesser degree of certainty the habitat would be protected for a federally listed species.

Colonial Nesting Waterbirds

Since the management action is identical to the one in Alternative C, please refer Alternative C for discussion of impacts.

Big Game

Since the management action is identical to the one in Alternative C, please refer Alternative C for discussion of impacts.

Sharp-Tailed Grouse

Since the management action is identical to the one in Alternative C, please refer Alternative C for discussion of impacts.

Bighorn Sheep

In relation to all anthropogenic disturbances or disruptive activities, including oil and gas development, please refer to Alternative C, since the management action is identical for these types uses.

The authorization of sheep and goat grazing does vary from the other alternatives The authorization process for domestic sheep or goat grazing permits within 14.3 miles of the bighorn sheep range (400,000 acres of BLM-administered land) without specific mitigation measures to reduce interaction with big horn sheep,

would result in increased bighorn sheep interaction with domestic sheep or goats and greater potential for epizootic disease transmission. However BLM controls a limited portion of this area and therefore this restriction may not be effective due to the lack of management control at the landscape scale.

Black-Tailed Prairie Dogs

This alternative provides for the conservation of known black-tailed prairie dog habitat (11,000 acres of BLM-administered lands and 29,000 acres of BLM administered oil and gas mineral estate). It is expected that the maintenance of the current habitat functionality would provide that anthropogenic activities would not limit the persistence of the species on BLM-administered lands. Although there would not be a loss of habitat, occupation of the habitat is unknown due to the disease factor (sylvatic plague).

Special Status Raptor Species

The raptor species discussed in this section include bald eagles, ferruginous hawks, burrowing owl, golden eagle, Swainson's hawk, and northern goshawk. For bald eagle impact discussions please refer to Alternative B as the management action is identical. For the other species, this alternative mimics Alternative A, which has the two-year timeframe for determining active nest. While the noticeable change in this alternative from Alterative B and C is that Alternative B and C have a seven-year timeframe for determining active nest.

Therefore, the impacts in relation to the two-year timeframe in this alternative would be the same as in Alternative A, which provided the two-year timeframe is not adequate to maintain current nesting habitat since the above raptors are territorial, develop multiple nests within a small area, and rotate among the nests. The two- year timeframe would decrease the amount of nesting habitat and preclude raptors from using nest sites in subsequent years. The result would be a reduction of raptors within the area of disturbance, which would not be mitigated by displaced raptors moving to other areas to nest.

Interior Least Tern

Since the management action is identical to the one in Alternative C, please refer Alternative C for discussion of impacts.

Piping Plover

Since the management action is identical to the one in Alternative C, please refer Alternative C for discussion of impacts.

Greater Sage-Grouse

The same greater sage-grouse management areas (general, priority, and restoration) are consistent for Alternatives B through E. However, different management is identified in each management areas.

General Habitat Management Areas

Alternative D would have the same types of impacts for greater sage-grouse as in Alternative C. The difference is that area of the conservation measure in this alternative has been reduced to 2 miles around leks. The consideration of greater sage-grouse habitat functionality in relation to all surface disturbing activities, including oil and gas development and habitat improvement projects, within 2 miles of a lek would conserve 341,000 acres of BLM-administered lands and 652,000 acres of BLM-administered oil and gas mineral estate.

In comparison to Alternative A, this management action provides for a much larger area of conservation for greater sage-grouse. For example, Alternative A leaves much of the general habitat available for anthropogenic disturbances without specific conservation measures for greater sage-grouse. Whereas, Alternative D has 641,000 BLM-administered oil and gas mineral estate more acres conserved with a CSU stipulation when compared to A.

Although this alternative provides fewer acres than in the Alternative B (less 301,000 acres of BLM-administered lands and 571,000 acres of BLM-administered oil and gas mineral estate), it is expected that the acreage included within the 2 mile radius in this management action would provide for greater sage-grouse habitat maintenance (breeding, nesting, and brood rearing) and connectivity on BLM-administered lands. Additionally and based on research in Southeast Montana, it is expected that approximately 68% of the nesting population would be captured with a 2 mile buffer area. However, the exact detail is unknown since site specific habitat quantity and quality on the above acres are unknown.

Priority Habitat Management Areas

The allowance of allowing multiple surface disturbing activities (including all anthropogenic disturbances) within a 640 acre polygon, as long as the total disturbance does not exceed 64 total acres, would result in fragmentation and degradation of the sagebrush habitat. This would reduce the landscape functionality on 861,000 acres of BLM-administered lands and 1,329,000 acres of BLM-administered oil and gas mineral estate. In addition and similar to Alternative C, this management action does not provide for the conservation of all habitats required at a landscape scale for greater sage grouse. For example, highly important brood rearing habitat often associated with Mesic areas would not be identified; therefore resulting in susceptibility of the area to anthropogenic disturbances without specific measures for the proactive management for greater sage-sage grouse.

In comparison to Alternative A, this management action provides for a much larger area of conservation for greater sage-grouse and provides a cap on anthropogenic activities. However, similar to both Alternative A and C, Alternative D would not provide for greater sage-grouse habitat maintenance and connectivity considerations on BLM-administered lands. While the exact detail is unknown, since site specific habitat quantity and quality on the above acres are unknown, it is expected there would be a decline of greater sage-grouse habitat functionality at a landscape scale and a decline in associated populations.

Restoration Areas

It is expected that greater sage-grouse habitat conditions on 86,000 acres of BLM administered lands and 198,000 acres of BLM administered oil and gas mineral estate, would be degraded from the current status, since habitat functionality is not required to be a maintained within this alternative. In addition, this alternative would result in the direct loss of breeding, nesting, and brood rearing habitat, since the only limitations are a 60 day timing feature and the ability to move the disturbance 200 meters from where proposed. While the exact detail is unknown, since site specific habitat quantity and quality on the above acres are unknown, it there would be an expected decline of greater sage-grouse habitat functionality at a landscape scale and a decline in associated populations.

Habitat Compensation

Habitat compensation is applicable to all greater sage-grouse areas. Habitat compensation would provide an incentive for proponents to avoid greater sage-grouse habitat and require compensation for lost habitat. Requiring proponents to compensate at a 1:1 ratio in General Habitat Areas and a 5:1 ratio in Priority and Restoration Areas would deter development of undisturbed habitat; or if disturbing habitat was unavoidable, minimize the amount of disturbance. As development is steered to the non-Priority and non-Restoration Areas, these actions would encourage providing replacement habitat or otherwise protecting habitat from future development. A 5:1 compensation ratio protects more habitat than was lost and assure suitable habitat for greater sage-grouse would be provided.

ALTERNATIVE E (Proposed)

Summary Statement

Surface disturbing and disruptive activates are allowed in the alternative; however Alternative E implements the use of required design features in order to maintain habitat functionality resulting from these surfacing-disturbing and disruptive activities. Therefore, Alternative E results in greater beneficial impacts to wildlife

habitats and populations than alternatives A, C, and D. In relation to Alternative B, this alternative is less restrictive in some instances.

Surface disturbance is estimated to impact 79,000 BLM administered acres, with 67,000 acres reclaimed, resulting in 12,000 acres of long-term disturbance. This includes disturbance from projects such as oil and gas development, coal, wildlife habitat projects, range improvements, prescribed fire and others. Of this surface disturbance, 54,500 acres are associated with projects benefitting the resource (e.g. habitat improvement projects) and 24,500 acres is related to consumptive uses (e.g. mining, oil and gas development, etc.). The improvement or restoration projects would have no long-term associate disturbance.

Impacts to Fish, Aquatic and Wildlife Habitats, including Special Status Species

Where management actions are applicable to all types of wildlife habitat and are not habitat or species specific, impacts are discussed in this section. Where specific impacts can be analyzed in greater detail, discussion will follow by habitat type. Management actions that impact all types of wildlife habitat that are discussed in further detail in this section includes livestock grazing, vegetation/fuels management, and OHV considerations.

For resource uses outside of the specific habitat types identified below or outside of the specific identified resource use identified below would be analyzed and mitigation applied at the project level for wildlife habitat (31,000 acres of disturbed BLM-administered lands). The application of the *Mitigation and Conservation Action Appendix*, as described in the common to all alternative would result in some degree of habitat fragmentation and/or the direct removal of vegetation on the acres above; and therefore would not provide previous habitat values or characteristics. However, the requirement of mitigation, and if necessary, compensation would result in the maintenance of wildlife habitat functionality in the long-term.

For livestock grazing, the implementation of making grazing allotments unavailable when not meeting standards for rangeland heath would result in increased cover and wildlife habitat value in the short-term for non-disturbance associated wildlife species. In addition, in the long-term it is expected that wildlife habitat functionality would be maintained and conserved due to allowing livestock grazing after a period of rest has allowed wildlife habitats to recover and stabilize.

Also, in relation to livestock grazing, the development of coal, locatable mineral or oil and gas on BLM-administered lands (estimated 15,000 BLM-administered acres) the suspension of livestock grazing would maintain the cover and reduce the herbivory on associated adjoining habitats. The alternative does contain specificity livestock grazing would be re-activated after application of Standards for Rangeland Health and since these Standards specifically include wildlife habitat consideration, long-term wildlife habitat functionality would be maintained if and when livestock grazing is authorized.

Finally in relation to livestock grazing, the suspension of livestock grazing until vegetative objectives are met following prescribed or wildland fires, or vegetative treatments would provide a short-term and long benefit to wildlife habitats through increased cover, available browse, and habitat vigor. However this management action does not contain prescriptions specifically addressing wildlife habitat values, and therefore does not provide certainty these values would be considered in the authorization process.

In relation to fuels management fuel treatments where allowed, would result in either more open forested conditions, which would improve the habitat for species selecting these habitats, or decreased encroachment of juniper and pine species, which would improve habitats for greater sage-grouse and other sagebrush-dependent species. Short-term impacts from any vegetation treatment would temporarily displace wildlife. Habitats would change immediately after treatments and then gradually evolve over time to provide for desirable wildlife habitat.

In addition to fuels management as a vegetation management action, vegetation management through the authorization of haying of public land only to meet allotment management objectives would result in the removal of cover aspect of wildlife habitat. This would primarily result decreased habitat values for avian species and cause temporary habitat fragmentation.

Lastly, there would no areas of open OHV use on BLM-administered lands. Instead the 2,400 acres of Open OHV use under Alternative A would be managed as a limited area. This alterative would still result in the same impacts to wildlife habitat described in Alternative A, since an intensive network of trail exist and would be used by OHVs.

Aquatics

In relation to pallid sturgeon this alternative results in approximately 10,000 acres of BLM administered oil and gas mineral estate and 11,000 acres of BLM administered lands of habitat on the Yellowstone and Missouri Rivers conserved through the application of a non-discretionary buffer and a prescription that activities would have to maintain habitat functionality. When compared to Alternative A, the 0.5 mile size of the buffer increases that conservation measures by approximately 14,500 of BLM administered oil and gas mineral estate, because it proactively manages the interaction the habitat with the adjacent uplands. This would provide greater assurance that pallid habitat would be maintained and functionality would remain when compared to Alternative A and Alternative D. In comparison to Alternative B and C, this management action has the same habitat impact and provides the same degree of certainty the highest degree of certainty the habitat of a federally protected species will not be affected by BLM authorized actions.

All surface-disturbing activities within Alternative E would have to benefit the functionality of 100-year floodplains of major stream and rivers, wetlands, riparian areas, waterbodies and streams; and therefore would maintain and conserve aquatic habitat because there is an intrinsic connection between these areas and aquatic habitat. In addition, the application of the buffer for riparian and wetland would ensure adjacent uplands maintain and conserve aquatic habitat on BLM administered lands through the reduction of erosion and sedimentation, bank instability, habitat fragmentation, and displacement of some aquatic wildlife.

Additionally, this alternative provides for the maintenance of the current natural flow regime and watershed functionality; and therefore would conserve and maintain the existing aquatic habitat dependent on overland flow. This would maintain dispersal and migration between habitats, which are key life history strategies for prairie fishes and other aquatic wildlife. In addition, the alternative does address sedimentation through water quality considerations, which would also provide for the conservation and maintenance of aquatic habitats.

Surface disturbing activities resulting from riparian, watershed and aquatic wildlife habitat improvement projects would result in approximately 5,700 BLM-administered acres of short-term disturbance. This would result in the same type of short and long-term impacts as described in Alternative A, C, and D as the estimated acres are the same. Conversely, this is approximately a 50% increase in acres of projects that would benefit aquatic wildlife habitat when compared to Alternative B.

Surface disturbing resource uses directly impacting aquatic habitat include the same acreage of development of springs (9 springs estimated to disturb 10 acres) and installation of pits/reservoirs (estimated at 710 acres) as in Alternatives A, and D. It is a decrease of a total of 185 acres when compared to Alternative C and an increase of 756 acres when compared to Alternative B. This disturbance would result in short-term aquatic habitat fragmentation, decreasing the connectivity of the aquatic habitat due to reduction of the normal flow regime or loss of functionality due to the disturbance. In the long-term, the design as of the spring developments would have to benefit the features associated with aquatic habitat (e.g. riparian and wetlands) and therefore not have any long-term impacts to the habitat type.

Colonial Nesting Waterbirds

Within this alternative, the potential impacts related to all anthropogenic disturbances, including oil and gas development would be result in the continued maintenance of habitat conditions on 650 acres of BLM administered lands and 1,100 acres of BLM administered oil and gas mineral estate. The buffer in combination of management actions for these species (i.e. buffer, timing, and NSO) would result in the consideration of indirect impacts and ensure functional nesting habitat is maintained on the above acres. This maintenance of functionality would provide a high degree of certainty that anthropogenic disturbances would not lead to nest abandonment or degradation of the habitat. When compared to all the other alternatives, Alternative E provides

for greater consideration of direct and indirect impacts at a scale that would provide for the character of the habitat to not be influenced by disruptive or disturbing activities.

Big Game

Since the management action is identical to the one in Alternative C, please refer Alternative C for discussion of impacts.

Sharp-Tailed Grouse

Since the management action is identical to the one in Alternative C, please refer Alternative C for discussion of impacts.

Bighorn Sheep

In relation to all anthropogenic disturbances or disruptive activities, including oil and gas development, please refer to Alternative C, since the management action is identical for these types uses.

The authorization of sheep and goat grazing does vary from the other alternatives. The authorization process for domestic sheep or goat grazing permits within 14.3 miles of the bighorn sheep range (400,000 acres of BLM-land) would include specific mitigation measures to reduce interaction with big horn sheep and would result in reduced opportunity for bighorn sheep interaction with domestic sheep or goats; therefore reducing potential for epizootic disease transmission. However BLM controls a limited portion of this area and therefore this restriction may not be effective due to the lack of management control at the landscape scale.

Black-Tailed Prairie Dogs

The impacts to black-tailed prairie dogs would be the same as in Alternative D. This is even the case with the addition of the 10 year time element as this element would not result in a reduction in available black-tailed prairie dog habitat or the associate populations on BLM-administered lands or mineral estate. After an entire colony has been inactive for 10 years, the habitat for the species is altered through natural processes (e.g. increase in plant cover and plant height) to a point that there is limited to no functional habitat remaining.

Special Status Raptor Species

The raptor species discussed in this section include bald eagles, ferruginous hawks, burrowing owl, golden eagle, Swainson's hawk, and northern goshawk. For bald eagle impact discussions please refer to Alternative B as the management action is identical. For the burrowing owl, golden eagle Ferruginous hawk, Swainson's hawk, prairie falcon and northern goshawk, this alternative provides for the conservation of the species habitat through ensuring of BLM authorized anthropogenic disturbances within 0.5 miles of nest sites active within the past seven years are only conducted when the functionality of the nest site and associated nesting habitat is maintained. The size of the buffer and the timing consideration for the above suite of species considers nest rotation habits and ensures functional habitat is present for the species (110, 000 acres of BLM-administered lands and 179,000 acres of BLM-administered oil and gas mineral estate).

In comparison to the other alternatives, Alternative E provides a balanced approach that ensures nest integrity is maintained and that nesting habitat would be available for future use by the special status raptor species. In addition, the Alterative also provides that anthropogenic disturbances within the prescribed buffered area will not lead to nest abandonment. The combination of both factors provides the highest degree of certainty the habitat of a special status species will not be affected and that BLM authorized actions would be in compliance with the Migratory Bird Treaty Act.

Interior Least Tern

Within this alternative, the functionality of interior least tern habitat (10,000 acres of BLM administered land and 11,000 acres of BLM administered oil and gas mineral estate) would not be impacted from anthropogenic

disturbances. The existing character and state of the habitat would remain, unless influenced by natural processes (e.g. flooding). With the application of the buffer, this alternative increases the conservation area through considering the indirect impacts to the interior least tern habitat from surface disturbing or disruptive activities outside of the occupied habitat. I n comparison to the other Alternatives, Alternative E provides a balanced approach that ensures nest integrity is maintained and that nesting habitat would be available for future use by the interior least tern. In addition, the Alterative also provides that anthropogenic disturbances within the prescribed buffer area will not lead to nest abandonment. The combination of both factors provides the highest degree of certainty the habitat of a federally protected species will not be affected by BLM authorized actions.

Piping Plover

Within this alternative, the functionality of piping plover habitat (4,000 acres of BLM administered land and 7,000 acres of BLM administered oil and gas mineral estate) would not be impacted from anthropogenic disturbances. The existing character and state of the habitat would remain, unless influenced by natural processes (e.g. flooding). With the application of the buffer, this alternative increases the conservation area through considering the indirect impacts to the piping plover habitat from surface disturbing or disruptive activities outside of the occupied habitat. In comparison to the other Alternatives, Alternative E provides a balanced approach that ensures nest integrity is maintained and that nesting habitat would be available for future use by the piping plover. In addition, the Alterative also provides that anthropogenic disturbances within the prescribed buffer area will not lead to nest abandonment. The combination of both factors provides the highest degree of certainty the habitat of a federally protected species will not be affected by BLM authorized actions.

Greater Sage-Grouse

The same greater sage-grouse management areas (general, priority, and restoration) are consistent for Alternatives B through E. However, different management is identified in each management areas. In addition and differently than other the Alternatives, Alternative E provides specific management actions for livestock grazing, minor rights-of-way, major rights-of way, mineral materials, wind energy, application of a regional mitigation strategy and consideration of lek buffer distances. The other alternatives group a majority of the above actions into other surface disturbing or disruptive activates.

General Habitat Management Areas

Excluding oil and gas development and major rights of way, other surface disturbing or disruptive activities within the general habitat management area (1.4 million acres of BLM-administered lands) would be allowed with design features to protect breeding, nesting and brood-rearing greater sage-grouse habitat. This would provide for the conservation of all the required habitat requirements for greater sage-grouse. This management action also provides for the implementation of habitat improvement projects for greater sage-grouse.

In relation the above resource uses and in comparison to the other alternatives, this management action provides for a much larger area of conservation for greater sage-grouse through the consideration of the entire area. Therefore, it is expected that this management action would provide for greater sage-grouse habitat life-cycle requirements and connectivity considerations on BLM-administered lands. It is expected that, unless modified by natural processes (e.g. fire), the status of the greater sage grouse habitat on BLM-administered lands will remain static and support existing associated populations.

Concerning oil and gas development, a two-mile consideration would ensure that greater sage grouse breeding, nesting, brood rearing, and winter habitat needs are met within 652,000 acres of BLM-administered oil and gas mineral estate. Although this alternative provides fewer acres than in the Alternative B and C, it is expected that the acreage included within the 2 mile radius in this management action would provide for greater sage-grouse habitat maintenance (breeding, nesting, brood rearing, and winter) and connectivity on BLM-administered lands. Additionally and based on research in Southeast Montana, it is expected that approximately 68% nesting population would be captured with a 2 mile buffer area. However, the exact detail is unknown since site specific habitat quantity and quality on the above acres are unknown.

Concerning major rights of way actions, this alternative provides for additional conservation measure for these types of actions. Only as a last alternative; after all other practical options have been exhausted; and with extensive mitigation for greater sage-grouse would a major rights-of-way projects be approved in the general habitat management area. This would ensure that greater sage-grouse habitats would be conserved and maintained; unless modified by natural processes (e.g. fire).

Priority Management Habitat Areas

When compared to all other alternatives, this alternative provides the highest level of conservation for 817,000 acres of BLM-administered land and 1,329,000 acres of BLM-administered oil and gas mineral estate. In specific, the threats of the development of renewable (wind and solar) energy and commercial mineral material permits are eliminated and will not impact greater sage-grouse habitat on the BLM-administered lands within the priority habitat management areas.

Concerning the other resources uses specified in this alternative, including livestock grazing, oil and gas, minor rights-of-way and major rights of way, this alternative provides certainty that the breeding, nesting, brood rearing and winter habitats for greater sage grouse would be conserved on BLM administered lands. It also provides that connectivity is maintained on the BLM administered lands. These factors, coupled with a 3% cumulative disturbance cap and a 5% project disturbance cap, ensures that BLM administered lands will continue to provide habitat connectivity and the multiple habitats available for greater sage-grouse occupation.

Restoration Habitat Management Areas

Differing from the other alternatives, Alternative E recognizes the specific land disturbance causal factor in each of the three restoration areas. However, this alternative provides the elimination of renewable energy (wind and solar) as a threat on 86,000 acres of BLM-administered lands; as this activity is not allowed on these lands in restoration areas. In addition, the implementation of minor and major rights-of-ways within this alternative would provide these types of actions do not further contribute to the fragmentation of the areas.

Concerning the Cedar Creek Restoration Habitat Management Area, this alternative contributes to the fragmentation to greater sage-grouse habitat and available greater sage-grouse habitat would decrease on approximately 1,750 acres of unleased BLM-administered oil and gas mineral estate (approximately 3% of the total area). Due to a well density of one well per 73 acres within this restoration area, it is not possible to provide for functional greater sage-grouse habitat at the landscape scale. It is expected greater sage-grouse habitat would be reclaimed and restored beyond the life of this plan, but the future occupation by greater sage-grouse is unknown.

In the West Decker and South Carter Areas, oil and gas development would not contribute to the fragmentation of greater sage-grouse habitat. However, other surface disturbing activities, including locatable and coal mining, would increase the fragmentation in these restoration management areas (approximately 69,000 acres of BLM-administered land) and therefore reduce the quantity of greater sage-grouse habitat. However, the exact detail is unknown since site specific habitat quantity and quality on the above acres are unknown. Due to existing disturbances within these areas, it is not possible to provide for functional greater sage-grouse habitat at the landscape scale. It is expected greater sage-grouse habitat would be reclaimed and restored beyond the life of this plan, but the future occupation by greater sage-grouse is unknown.

Habitat Compensation

Habitat compensation is applicable to all greater sage-grouse areas. Habitat compensation would provide an incentive for proponents to avoid greater sage-grouse habitat and require compensation for lost habitat. Requiring proponents to initiate compensation per BLM guidance would deter development of undisturbed habitat; or if disturbing habitat was unavoidable, minimize the amount of disturbance. Because development would be steered to the non-Priority and non-Restoration Areas, these actions would encourage providing replacement habitat or otherwise protecting habitat from future development. Habitat compensation designed to meet the goals and objectives in Priority and Restoration Areas would be accomplished by requiring proponents to:

CUMULATIVE IMPACTS

Aquatics

Summary Statement

Wildlife habitats associated with rivers and streams have been affected by past land use, dams and reservoirs, natural events, changes in local and global climatic patterns, and current management actions. Historically, prairie streams, in which species thrived in perennial pools of intermittent streams with intact riparian zones, contained warm-water fish and other aquatic wildlife species adapted to a flow regime that straddled a delicate balance of drying and flooding. Aquatic wildlife in the larger perennial streams and rivers were generally adapted to free-flowing river systems in which some species, such as the paddlefish and pallid sturgeon, required unimpeded access to miles of river habitat to complete their life cycles.

Construction of reservoirs or changes in flows have altered the movements of fishes in intermittent or ephemeral streams, altered the flow of water crucial to maintaining downstream aquatic habitats and also reduced the movement of sediment, which is important for some native fishes. Reservoirs built within intermittent or perennial drainages result in an increased level of livestock use around the reservoir. When this occurs it does reduce the functionality of the aquatic habitat by increasing surface temperature, sediment transport, and nutrient loading. On some non-BLM lands, impact of reservoirs and the associated livestock use will result in an increased use of adjacent BLM lands. Although reservoir construction on all ownership has been reduced in past years, it does continue and as a result will impact adjacent public lands.

In addition, unless properly managed livestock will typically spend a disproportionate amount of time in riparian areas; and therefore directly impact riparian areas and aquatic wildlife. Historically this resulted in a widespread loss of riparian cover and subsequent changes, including streambank erosion, loss of streambank stability, and alteration of in-stream habitat and food webs. When proactive grazing management practices are implemented there have been improvements in riparian habitat and aquatic functionality. On BLM-administered lands aquatic habitats will be conserved, maintained and improved through compliance with Standards for Rangeland Health.

On a landscape scale, historical cumulative impacts from land use activities have dramatically increased erosion, altered thermal and hydrologic regimes, decreased riparian vigor and riparian connections with streams, and increased the numbers and impacts of exotic species, subsequently pushing some aquatic wildlife to the edge of tolerance or even to localized extirpation. Anthropogenic disturbances, such as oil and gas development, road construction, urban expansion, the spread of introduced species, drought and climate change, and continued reservoir development, have compounded the impacts of constrained prairie stream and river ecosystems.

Alternative A (No Action)

Alternative A would contribute to a declining trend in aquatic habitat conditions of prairie streams and rivers. This alternative would decrease riparian vigor, continue erosion and sedimentation of aquatic wildlife habitat, and fail to protect aquatic wildlife movement and migration patterns. BLM's contribution to this potential reduction in aquatic habitat is relative small as the Miles City Field Office manages less than 5% of the streams and 11% of the total land base in the planning area.

Alternative B

Alternative B would allow for the possible improvement of habitat conditions of prairie stream and rivers through the elimination of anthropogenic disturbances from the area. This alternative would decrease erosion and sedimentation or physical pollution; improve and maintain aquatic wildlife movement and migration patterns at stream-road crossings; and increase riparian vigor, which would restore physical and biological connections between the riparian zone and stream. This alternative would also help to protect the endangered pallid sturgeon and sensitive fish, amphibians, and reptile species. However, the inability to implement habitat improvement projects would result in a long-term decline in aquatic habitat conditions, especially in areas

identified for restoration or after a catastrophic event. BLM's contribution to these impacts is relative small as the Miles City Field Office manages less than 5% of the streams and 11% of the total land base in the planning area.

Alternative C

Alternative C would enable habitat conditions within riparian areas, prairie streams and rivers to be maintained, through the use of buffers and NSO stipulations for oil and gas leasing and development. This alternative would increase riparian vigor, decrease erosion and sedimentation or physical pollution of aquatic wildlife habitat, and repair and protect aquatic wildlife movement and migration patterns. BLM's contribution to these impacts is relative small as the Miles City Field Office manages less than 5% of the streams and 11% of the total land base in the planning area.

Alternative D

Alternative D would contribute to a general declining trend in habitat conditions of riparian areas, prairie streams and rivers. This alternative would decrease riparian vigor, continue erosion and sedimentation, and fail to protect aquatic wildlife movement and migration patterns. BLM's contribution to these impacts is relative small as the Miles City Field Office manages less than 5% of the streams and 11% of the total land base in the planning area.

Alternative E (Proposed)

Alternative E would maintain habitat conditions of some prairie streams and rivers, through the use of buffers and NSO stipulations for oil and gas leasing and development in streams, waterbodies, riparian areas, and wetlands. This alternative would increase riparian vigor, decrease erosion and sedimentation or physical pollution of aquatic wildlife habitat, and repair and protect aquatic wildlife movement and migration patterns. BLM's contribution to these impacts is relative small as the Miles City Field Office manages less than 11% of the streams and 11% of the total land base in the planning area.

Terrestrial

Summary Statement

Historically, there have been many actions that have cumulative impacted the quality and quantity of wildlife habitat in the planning area. Some of the notable anthropogenic disturbances that have impacted wildlife habitat have included the conversion of native habitats to cropland or improved pastures; the construction of roads, transmission lines, pipelines, and urban dwellings; and the introduction of livestock grazing. All of the above actions, as wells as the expected continuance of these actions, will increase the fragmentation of wildlife habitat in the planning area. In regard to oil and gas restrictions the cumulative restriction per alternative is contained in Table 4-25.

In addition, it is expected that cumulative impacts from climate changes are will also contribute to habitat fragmentation for some wildlife and increase habitat size for other species. At this time, there is not a quantifiable mechanism to predict which type of wildlife habitat would be impacted by climate change. However, it can be expected that climate change is likely to affect wildlife breeding patterns, water and food supply, and habitat availability.

TABLE 4-25.
CUMULATIVE OIL AND GAS RESTRICTIONS PER ALTERNATIVE

Stipulation or Action	BLM-administered Surface and Mineral Acres				
	A	B	C	D	E
Closed	86,651	1,562,942	83,160	83,160	83,160
NSO	1,473,375	2,102,747	287,691	99,442	1,952,253
CSU	574,940	1,131,802	4,205,502	4,119,996	2,491,701
Timing Limitation	1,848,469	0	0	0	6,986
Lease Terms	1,080,790	210,884	434,651	715,163	483,786

Greater Sage-grouse

Greater sage-grouse have experienced population declines as a result of multiple factors. Greater sage-grouse population declines are associated with a direct loss in habitat or functionality including cultivation, spraying, conifer encroachment, improper livestock grazing, ROWs and industrial use. Population responses by greater sage-grouse to these disturbances depend on multiple factors, including but not limited, to scale and duration of the development, West Nile disease outbreaks, and the degree to which adjacent habitat on non-BLM-administered lands was altered.

If BLM effectively restricted development activities, but adjacent lands were disturbed through tillage, improper livestock grazing practices, or other surface disturbing or disruptive activities, the effectiveness of BLM actions would be limited and decreases in greater sage-grouse populations on and off BLM-administered lands would be expected. Even if development occurred in a way that BLM-administered lands were avoided, development occurring on the non-BLM administered lands, could result in greater sage-grouse populations occupying BLM-administered lands being reduced or extirpated.

The scattered BLM land pattern within the planning area provides challenges for greater sage-grouse management. As illustrated above, the conservation or improvement of the greater sage-grouse habitat and the association populations depends heavily on actions taken by other land managers. This would be especially evident in:

- General Habitat Management Areas (BLM administers 14% of the surface and 29% of the federal mineral estate),
- North Rosebud Priority Habitat Management Area (BLM administers 9% of the surface and 13% of the federal mineral estate),
- East Decker Priority Habitat Management Area (BLM administers 6% of the surface and 95% of the federal mineral estate).

While there is a greater opportunity for BLM influence on greater-sage-grouse habitat in the:

- Carter Priority Habitat Management Area (BLM administers 38% of the surface and 64% of the federal mineral estate)
- North Garfield Priority Habitat Management Area (BLM administers 6% of the surface and 95% of the federal mineral estate).

On a greater-sage grouse occupied habitat scale in the planning area BLM only manages 15% of the surface estate and 39% of the entire mineral estate, which includes 27% of the oil and gas estate. Therefore, BLM's actions by themselves with not provide for the assurance of continued persistence of the species across the range of the currently occupied habitat in the planning area. In the Carter and Garfield Priority Habitat Management Areas the BLM-administered lands are fairly well blocked; and therefore BLM may have a greater influence on species persistence in these areas; however, the needed connectivity for population

viability will heavily rely on the habitat functionality on other surface owner's estate. Therefore, due to the land pattern the planning area cumulative analysis for greater sage-grouse will rely heavily on actions taken by other land managers and be unable to be reasonably estimated.

Alternative A (No Action)

Wildlife habitat, including functionality would slowly degrade, resulting in long-term declines in a number of wildlife populations, including special status species. This decline would be a result of direct habitat loss and fragmentation, displacement, and wildlife avoidance of impacted areas. Management actions proposed under Alternative A have historically led to areas that experienced downward trends of wildlife habitats and associated wildlife species, including greater sage-grouse. When combined with expected land use and development on other ownerships we expect an increase in the potential for adverse wildlife habitat cumulative effects. These effects include the potential of long-term declines in big game crucial winter range, sharp-tailed grouse habitat, raptor habitat, other avian species habitats and sagebrush habitats. This would result in declines in multiple wildlife species, including sagebrush obligates, and in some areas would contribute to the extirpation of greater sage-grouse. The BLM contribution to this increased potential for degradation is relatively small as the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area.

Alternative B

Management actions proposed under Alternative B would reduce direct habitat loss, habitat fragmentation, and displacement of wildlife in the planning area. This would include big game crucial winter range, sharp-tailed grouse habitat, raptor habitat, other avian species habitats and sagebrush habitats. The BLM contribution to this reduction is relatively small as the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area. In addition, in degraded areas where improvement projects would be required to improve the habitat, these areas would not improve in the short or long-term.

Greater Sage-Grouse

Greater sage-grouse management actions under Alternative B would ensure that BLM actions would not contribute to the degradation of greater sage-grouse habitat on BLM lands in general and priority habitat management areas. This is evident in that this alternative eliminates BLM authorized anthropogenic disturbances on 2.1 million acres of BLM administered lands, which would include the Priority Habitat Management Areas. This would include 123,000 acres of BLM-administered lands within high oil and gas development potential; 156,000 acres of BLM-administered lands within medium potential; 951,000 acres of BLM-administered lands within low potential. The BLM contribution to this increased protection for greater-sage grouse habitat is relatively small as the Miles City Field Office only manages approximately 12% of the surface estate and 39% of the mineral estate in the general habitat management areas; and 23% of the surface estate and 39% of the mineral estate in the priority habitat management areas.

Within Restoration Habitat Management Areas, although possible to maintain functional habitat, it would not be maintained at a level existing prior to development and therefore not support the populations that existed prior to disturbance. This is especially evident in Cedar Creek Area. As a result of existing disturbances and stressors, such as West Nile disease, populations would decline further in the Cedar Creek Area and extirpation of greater sage-grouse populations within areas of disturbance is possible. BLM's ability to counteract this decline is limited as only 8% of the BLM-administered oil and gas estate is not leased and the BLM-administers only 32% of the surface estate. While this alternative focuses on restoration activities, the BLM's contribution to restoration efforts for greater-sage grouse habitat in restoration management areas is relatively small as the Miles City Field Office only manages approximately 23% of the surface estate and 39% of the mineral estate.

Alternative C

Management actions proposed under Alternative C would reduce direct habitat loss, habitat fragmentation, and displacement of wildlife in the planning area. This would include conserving and maintaining big game crucial winter range, black-tailed prairie dog habitat, sharp-tailed grouse habitat, raptor habitat, other avian

species habitats and sagebrush habitats. The BLM contribution to this reduction is relatively small as the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area. In addition, in degraded areas where improvement projects would be required to improve the habitat, these areas would improve in the short and long-term.

Greater Sage-Grouse

Greater sage-grouse management actions under Alternative C requires habitat compensation, imposing restrictions for surface disturbing activities and oil and gas leasing, and improved grazing management. This would be most effective in Greater sage-grouse General and Priority Habitat Management Areas and less so in Restoration Habitat Management Area.

Alternative C would ensure that BLM actions would conserve and maintain the greater sage-grouse sagebrush habitat on BLM lands in general habitat management areas through providing functional habitat within 3.1 miles of leks. This would provide for the continued maintenance of 88% of the nesting habitat and also take into consideration the brood rearing and winter habitat within the prescribed buffer. This would result in increased lek and species persistence on BLM-administered lands. The BLM contribution to this maintenance and conservation effort for greater-sage grouse habitat is relatively small as the Miles City Field Office only manages approximately 12% of the surface estate and 39% of the mineral estate in the general habitat management areas.

Within the Priority Habitat Management Areas, allowing one surface disturbing activity per 640 acres and no more than 3% of the sagebrush habitat as long as functional habitat was maintained would provide for the conservation of sagebrush habitats needed to maintain viable populations of greater sage-grouse on BLM-administered lands. However, the lack of conservation protection measures would result in the degradation of brood rearing habitat and in a decrease of the population. The BLM's contribution to the maintenance of sagebrush and the degradation of brood rearing habitat is relatively minor as BLM's only manages 23% of the surface estate and 39% of the mineral estate in the priority habitat management areas.

Within Restoration Habitat Management Areas, although possible to minimize impacts to functional habitat, it would not be provided at a level existing prior to development and therefore not support the populations that existed prior to disturbance. This is especially evident in Cedar Creek Area. As a result of existing disturbances and stressors, such as West Nile disease, populations would decline further in the Cedar Creek Area and extirpation of greater sage-grouse populations within areas of disturbance is possible. BLM's ability to counteract this decline is limited as only 8% of the BLM-administered oil and gas estate is not leased and the BLM-administers only 32% of the surface estate. While this alternative focuses on restoration activities, the BLM's contribution to restoration efforts for greater-sage grouse habitat in restoration management areas is relatively small as the Miles City Field Office only manages approximately 23% of the surface estate and 39% of the mineral estate.

Alternative D

Under Alterative D, wildlife habitat functionality would slowly degrade, resulting in long-term declines in a number of wildlife populations, including special status species. This decline would be a result of direct habitat loss and fragmentation, displacement, and wildlife avoidance of impacted areas. When combined with expected land use and development on other ownerships we expect an increase in the potential for adverse wildlife habitat cumulative effects. These effects include the potential of long-term declines in big game crucial winter range, sharp-tailed grouse habitat, raptor habitat, other avian species habitats and sagebrush habitats. This would result in declines in multiple wildlife species, including sagebrush obligates, and in some areas would contribute to the extirpation of greater sage-grouse. The BLM contribution to this increased potential for degradation is relatively small as the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area.

Greater Sage-Grouse

Greater sage-grouse management actions under Alternative D requires habitat compensation, imposing restrictions for surface disturbing activities and oil and gas leasing, and improved grazing management. This would be most effective in Greater sage-grouse General and Priority Habitat Management Areas and less so in Restoration Habitat Management Area.

Alternative D would ensure that BLM actions would conserve and maintain the greater sage-grouse sagebrush habitat on BLM lands in general habitat management areas through providing functional habitat within 2 miles of leks. This would provide for the continued maintenance of 68% of the nesting habitat and also take into consideration the brood rearing and winter habitat within the prescribed buffer. This would result in increased lek and species persistence on BLM-administered lands. The BLM contribution to this maintenance and conservation effort for greater-sage grouse habitat is relatively small as the Miles City Field Office only manages approximately 12% of the surface estate and 39% of the mineral estate in the general habitat management areas.

Within the Priority Habitat Management Areas, allowing one surface disturbing activity per 640 acres and no more than 10% of the sagebrush habitat as long as functional habitat was maintained would not provide for the conservation of sagebrush habitats needed to maintain viable populations of greater sage-grouse on BLM-administered lands. The BLM's contribution to the degradation of the greater sage-grouse habitat is relatively minor as BLM's only manages 23% of the surface estate and 39% of the mineral estate in the priority habitat management areas.

Within Restoration Habitat Management Areas, managing surface disturbing and disruptive activities according to timing and a 200 meter avoidance would contribute to the decline in greater sage-grouse habitat functionality and the associated populations. This is especially evident in Cedar Creek Area. As a result of existing disturbances and stressors, such as West Nile disease, populations would decline further in the Cedar Creek Area and extirpation of greater sage-grouse populations within areas of disturbance is possible. BLM's ability to counteract this decline is limited as only 8% of the BLM-administered oil and gas estate is not leased and the BLM-administers only 32% of the surface estate. While this alternative focuses on restoration activities, the BLM's contribution to restoration efforts for greater-sage grouse habitat in restoration management areas is relatively small as the Miles City Field Office only manages approximately 23% of the surface estate and 39% of the mineral estate.

Alternative E (Proposed)

Depending on actions occurring on private lands and depending on the wildlife habitat type impacted as a result of BLM management actions, habitat conditions, including functionality would generally improve under Alternative E. This would include improvement or conservation for big game crucial winter range, sharp-tailed grouse habitat, colonial nesting waterbird habitat, black-tailed prairie dog habitat, piping plover habitat, bighorn sheep habitat, interior least tern habitat, raptor habitat, other avian species habitats, and sagebrush habitats. The BLM contribution to this improvement is relatively small as the Miles City Field Office only manages approximately 11% of the surface estate in the analysis area. In addition, in degraded areas where improvement projects would be required to improve the habitat, these areas would improve in the short or long-term.

Greater Sage-Grouse

The proposed plan (Alternative E) would provide for the net conservation of Greater Sage-grouse habitat by proactively managing surface-disturbing activities, grazing management, and oil and gas leasing. This would be most effective in Greater Sage-grouse General and Priority Habitat Management Areas and less so in Restoration Habitat Management Areas. Additionally, Alternative E proposes specific resource use restrictions (e.g. major rights-of-way avoiding GHMAs and PHMAs) not conducted under current management (Alternative A).

BLM's proposed management on 2.3 million acres of BLM-administered lands and 6.3 million acres of BLM-administered mineral estate within Greater Sage-grouse habitat areas would result in addressing the threats in the COT report for the specific PACs in the planning area. As compared to current management, Alternative E would eliminate the threats from agriculture conversion; sagebrush conversion; urbanization; grazing; recreation; conifers; and fire management on the BLM-administered lands or mineral estate within all greater-sage grouse habitat areas. In addition, solar, wind, oil, and gas development would be eliminated as threats under Alternative E in the Priority Habitat Management Areas.

Unlike current management, Alternative E would ensure infrastructure, energy development, mining, wind and solar activities are developed outside of Priority Habitat Management Areas. Activities would be implemented in a manner that would result in the improvement or maintenance of Greater Sage-grouse habitat on BLM administered lands through the use of required design features, mitigation, or compensation. The required design features, applied mitigation, and compensation actions would ensure BLM's actions maintain habitat for Greater Sage-grouse.

BLM's contribution to cumulative effects from Greater Sage-grouse habitat management and effectiveness regarding the alleviation of the threats corresponds to BLM's 15% surface administration and 40% mineral administration in the planning area. BLM's proposed actions, along with the State of Montana's proposed restrictions in Greater Sage-grouse habitat, would result in a net conservation gain for Greater Sage-grouse in all habitat types regardless of ownership. Additionally, other federal agency efforts (e.g. NRCS) in combination with BLM's management efforts would reduce the threats to habitat (e.g. conversion to agriculture and sagebrush elimination).

In consideration of all actions proposed there would be a net conservation gain for Greater Sage-grouse in the planning area. Alternative E focuses resource uses outside of PHMAs. This would provide for the long-term conservation of the life-cycle habitat required for the highest density of Greater Sage-grouse populations in the planning area. Additional conservation gain is evident through the management of connectivity for genetic flow through ensuring actions outside of Priority Habitat Management Areas are managed to maintain or improve greater sage-grouse habitat.

GREATER SAGE-GROUSE CUMULATIVE EFFECTS ANALYSIS

This cumulative effects analysis (CEA) discloses the long-term effects on Greater Sage-Grouse (GRSG) from implementing each RMP/EIS alternative in conjunction with other past, present, and reasonably foreseeable future actions. In accordance with Council on Environmental Quality guidance, cumulative effects need to be analyzed in terms of the specific resource and ecosystem being affected (Council on 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 GRSG habitat by reducing, eliminating, or minimizing threats to GRSG habitat. The Western Association of Fish and Wildlife Agencies (WAFWA) delineated seven sage-grouse management zones 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 Miles City planning area boundary and incorporates WAFWA Management Zone (MZ) I.

The analysis of BLM actions in MZ I 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 Miles City RMP, by alternative, when added to those actions. The analysis of nonfederal lands and actions includes the following:

- State plans
- Coordination with states and agencies during consistency reviews
- Additional data from non-BLM-administered lands

Approximately 23.4 million acres of the Miles City planning area is located in MZ I and it contains approximately one-third of the priority habitat management areas (PHMA) in MZ I and forty percent of general habitat management areas (GHMA) in MZ I. However, the BLM administers only approximately 23 percent of

the PHMA and 12 percent of the GHMA in the planning area. Still, as one of the larger planning areas in MZ I, actions in the Miles City RMP/EIS may have an important cumulative impact on GRSG.

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 and general habitat.
- The USFWS's 12-Month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered" (USFWS 2010) and the USFWS publication Conservation Objectives: Final Report (i.e., the COT Report; USFWS 2013) were reviewed to identify the primary threats facing GRSG in each WAFWA MZ. Table 2 of the COT Report lists threats to GRSG that are present and widespread in each population in the MZ.
- For MZ I the list of threats that are directly or indirectly affected by BLM actions are energy development/mining, infrastructure, grazing, conversion to agriculture, fire, spread of weeds, and recreation (USFWS 2013). Two other threats listed in the COT report, sagebrush eradication and isolation/small population size, affect GRSG populations in MZ I.
- 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 GRSG in each planning area in the MZ, but each poses a present and widespread threat to at least one population.
- Predation was not included as a threat in the final COT report and was not identified by USFWS as a significant threat to GRSG 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 GRSG nests. In such altered habitats, predators may exert an undue influence on GRSG populations. Predation is discussed in this CEA in the context of these other threats.
- 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 BLM RMP/EISs in MZ I. These datasets provide a means by which to quantify cumulative impacts of direct impacts of the threats identified in the COT report.
    - PHMA and GHMA were developed to protect the best habitat and highest population density of GRSG. Although Alternative A does not designate PHMA or GHMA, spatial GIS data were clipped to these boundaries to allow for a consistent comparison across all alternatives.
    - 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 GRSG from each of the threats in MZ I.
    - The tables in this cumulative analysis display the number of acres across the entire MZ and the percentage of those acres that are located within the Miles City planning area. To calculate the total number of acres in the MZ, the number of acres in the other BLM and Forest Service proposed plans across MZ I are added to the number of acres in the applicable Miles City RMP alternative. For example, the total number of acres for Alternative A includes all of the other proposed plans in MZ I plus Miles City RMP Alternative A. Likewise, the Alternative B acreage includes all of the other proposed plans in MZ I plus Miles City RMP Alternative B.
- Each alternative is summarized in the Conclusion section. Each alternative considers the cumulative impacts on GRSG 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 non-BLM actions in MZ I.

- The list of relevant cumulative actions was derived from each proposed BLM RMP in MZ I 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 Plan, are used in this analysis.
- This analysis uses the most recent information available. For purposes of this analysis, the BLM has determined that the Proposed Plans for the other ongoing GRSG planning efforts in MZ I are reasonably foreseeable future actions.

ASSUMPTIONS

This cumulative analysis uses the same assumptions and indicators as those established for the analysis of direct and indirect effects on GRSG. 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; the quantitative impact analysis focuses on impacts across the MZ. The MZ is the appropriate geographic scope for this analysis because it encompasses areas with similar floristic conditions containing important GRSG habitat.
- The magnitude of each threat would vary geographically and may have more or less impact on GRSG in some parts of the MZ, depending on such factors as climate, land use patterns, and topography.
- A management action or alternative would result in a net conservation gain to GRSG if there is an actual benefit or gain above baseline conditions. Baseline conditions are defined as the pre-existing condition 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 environment 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.
- The CEA quantitatively analyzes impacts on GRSG and their habitat in the MZ. Impacts on habitat are likely to correspond to impacts on populations within the management zone (MZ I), since 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 also could increase opportunities for predation, disease, or other stressors (Connelly et al. 2004; USFWS 2010; Manier et al. 2013).

EXISTING CONDITIONS IN WAFWA MZ I AND THE MILES CITY RMP PLANNING AREA

This section summarizes existing conditions and past and present actions for the Miles City RMP planning area (provided in more detail in Chapter 3) and for MZ I as a whole. Reasonably foreseeable future actions are discussed in Table K.

GRSG Habitat and Populations

MZ I consists of four GRSG populations: the Dakotas, Northern Montana, Powder River Basin, and Yellowstone Watershed (Garton et al. 2011). The Miles City planning area covers portions of the Yellowstone Watershed and Powder River Basin GRSG populations. MZ I contains some of the highest-connected networks of GRSG leks in the range (Knick and Hanser 2011); however, it also contains less productive sagebrush, similar to areas where GRSG have been extirpated (Wisdom et al. 2011). 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 GRSG populations.

In MZ I, state and private lands account for approximately 35 million acres of GRSG habitat (approximately 75 percent of habitat), with BLM-administered and other federal land accounting for only 25 percent of surface estate (Manier et al. 2013, p. 118).

Table A provides a breakdown of landownership and acres of GRSG habitat in MZ I. As the table shows, approximately 26 percent of PHMA and 13 percent of GHMA is on BLM-administered lands. In the Miles City planning area, there are approximately 16 million acres of GRSG habitat, including approximately 2.3 million acres (15 percent) on BLM-administered lands. The remaining 13.7 million acres (85 percent) of GRSG habitat comprise private, local state, and other federal and tribal lands.

Due to the patchwork distribution of landownership, the conservation results obtained on any ownership are limited unless conservation actions are enacted across ownership boundaries.

TABLE A.
MANAGEMENT JURISDICTION IN MZ I 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%)
National Forest System	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%)

Source: Manier et al. 2013, p. 118

Planning Area Habitat Conditions and Management

Sagebrush, primarily Wyoming big sagebrush, is the most dominant shrubland type in the planning area. Wyoming big sagebrush tends to grow in the low to mid elevations on the drier sites, while mountain big sagebrush occurs in upper elevations in moister conditions. Vegetation communities in the planning area are intermingled, because they represent a transition between the intermountain basin sagebrush communities to the west and the prairie communities to the east. The grasslands and shrublands of the planning area are substantially threatened by conversion to agriculture, or tillage.

In Montana, the GRSG population declined sharply from 1991 to 1996 before increasing in the early 2000s. For most of the Miles City planning area, 2010 lek data shows 386 leks unconfirmed, 455 confirmed active leks, 33 extirpated leks, and 19 confirmed inactive leks (10 or more years) (MFWP data, Beyer, Foster, and Denson 2010). The total males counted in MFWP trend areas peaked in 2006 at 988 males, but the overall trend appears stable (Beyer et al. 2010). In portions of MZ 1, GRSG populations have declined through wholesale loss of habitat and through impacts of disturbance and direct mortality to birds on the remaining habitat. The most pervasive and extensive change to the sagebrush ecosystems in MZ 1 is the conversion of nearly 60 percent of native habitats to agriculture (Samson et al. 2004).

The COT Report considers the Powder River Basin population at risk of extirpation, and the Yellowstone Watershed population potentially at risk (USFWS 2013).

Cedar Creek Anticline, North Garfield and Carter GRSG areas are of particular management interest to the BLM's Miles City Field Office. Cedar Creek Anticline on the Montana-North Dakota border is the smallest of the three GRSG areas, encompassing 780 square miles, and already heavily developed for oil and gas extraction. North Garfield covers 1,090 square miles, with tillage being the primary stressor to GRSG populations. The Carter GRSG area is 5,200 square miles, including Carter County (the southeastern-most county in Montana) and parts of neighboring counties in Wyoming and South Dakota. Carter is largely

undeveloped, both in terms of tillage and oil and gas wells, yet has development potential for both (Taylor et al. 2010).

Miles City RMP Alternatives

The Miles City PRMP/FEIS evaluates the following alternatives:

- Alternative A, current management (the no action alternative)
- Alternative B, which emphasizes conservation of physical, biological, heritage, and visual resources, with constraints on resource development and use on BLM-administered lands
- Alternative C, which emphasizes resource uses by limiting conservation measures afforded to physical, biological, heritage, and visual resources on BLM-administered lands and expands opportunities for mineral development and other use;
- Alternative D, which allows the most resource use and development but maintains protections according to applicable laws and regulations, and
- Proposed Plan, which allows resource use if the activity can be conducted in a manner that conserves physical, biological, heritage, and visual resources.

Alternatives A and C and D manage GRSG with a localized lek-centered approach, whereas Alternatives B and the Proposed Plan manage GRSG at a landscape scale with larger buffers and more protected areas. Though currently GRSG are not managed using PHMA and GHMA designations, for comparison purposes in the data tables below, delineates acreages by PHMA and GHMA for both the planning area and for MZ I as a whole.

Population Trends in Management Zone I

GRSG has been extirpated from almost half of its original range in WAFWA MZ I; populations continue to decline by 2 to 4 percent annually (Manier et al. 2013). The MZ I GRSG population was estimated to be 14,814 males in 2007, having declined 17 percent in the number of males per lek since 1965. The number of leks declined by 22 percent over the same period (Manier et al. 2013). Lek counts indicate a 67 percent drop in MZ I from 2007 to 2013 (Garton et al. 2015).

In Montana, the GRSG population changes cyclically. The GRSG 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 percent 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 (Greater Sage-Grouse Habitat Conservation Advisory Council 2014). Northern Montana population dropped 54 percent to 1,667 males in 2013, while the Yellowstone Watershed population dropped 65 percent to 3,045 males (Garton et al. 2015)

Similarly, Wyoming data 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/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, greater than that indicated by the average lek size. Similar population trends are suggested at both state and local scales (Christiansen 2013). The Powder River Basin population dropped 76 percent from 2007 to 2013, to 1,651 males (Garton et al. 2015).

In the Dakotas, GRSG numbered approximately 300 male birds in 2013, a drop of 72 percent from 2007 (Garton et al. 2015). Although North and South Dakota populations remain connected populations to the west in Montana, their small size, situation on the edge of GRSG range and ongoing threats place them at high risk (Manier et al. 2013, p. 127; USFWS 2013).

Regional Efforts to Manage Threats to GRSG

Across the Greater Sage-Grouse range, other BLM and National Forest System sub-regions are undergoing RMP revision or amendment processes similar to this one for the Miles City Field Office. The Final EIS associated with each of these efforts has identified a Proposed Plan that meets the purpose and need of conserving, enhancing, and/or restoring GRSG habitat by reducing, eliminating, or minimizing threats. The management actions from the various Proposed Plans will cumulatively decrease the threat of GRSG habitat loss and will limit fragmentation throughout the range. Key actions present in many of the Proposed Plans include changes in land use allocation, a mitigation framework, an adaptive management strategy, anthropogenic disturbance cap, and protective management actions in priority and general habitat areas.

The BLM has incorporated management of Sagebrush Focal Areas (SFAs) into its proposed management approach for GRSG. SFAs are a subset of PHMA and represent recognized "strongholds" for the species that have been noted and referenced by the conservation community as having the highest densities of the species and other criteria important for the persistence of the species (Ashe 2014). Those portions of SFAs on BLM-administered lands would be petitioned for withdrawal from mineral entry, subject to an NSO stipulation with no exceptions, modifications, or waivers, and are prioritized for management and conservation actions, including, but not limited to, review of livestock grazing permits/leases. The Miles City planning area contains a portion of the 1,807,600-acre North Central Montana SFA. However, the Miles City portion of the SFA is contained within the Seven Blackfoot Wilderness Study Area; this area is closed to leasing.

In addition, there are several regional efforts to manage threats to GRSG in MZ I. These efforts may have a greater ability to alleviate threats to GRSG than BLM actions. This is because state and private lands account for approximately 35 million acres (approximately 75 percent) of GRSG habitat in MZ I (Manier et al. 2013, p. 118).

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 GRSG habitat requirements with demand for energy development (Doherty et al. 2011).

In 2000, the Wyoming Sage-Grouse Working Group (WSGWG) was formed to develop a statewide strategy for GRSG conservation. This group prepared the Wyoming GRSG Conservation Plan (WSGWG 2003) to provide coordinated management and direction across the state. In 2004, local GRSG working groups were formed to develop and implement local conservation plans. Eight local working groups around Wyoming have completed conservation plans, many of which prioritize addressing past, present, and reasonably foreseeable threats at state and local levels, and prescribe management actions for private landowners to improve GRSG conservation at the local scale, consistent with the overall Wyoming Core Strategy. The BLM participates in the Northeast Wyoming local working group. The Northeast Wyoming Sage-Grouse Conservation Plan was completed in 2006 and was updated in 2014 (Northeast Wyoming Sage-grouse Working Group 2014). The local and regional working group plans would assist in GRSG conservation through monitoring, public awareness, and voluntary protective actions on private land.

Wyoming Executive Order

Wyoming Governor Matt Mead issued an executive order on June 2, 2011, that complemented and replaced several executive orders issued by his predecessor. The 2011 Wyoming executive order articulates Wyoming's Core Population Area Strategy (Core Area Strategy) as an approach to balancing GRSG conservation and development. It also provides an approach to mitigating human disturbances to GRSG. The USFWS believes that Wyoming's Core Area Strategy, if extended to all landowners via regulatory mechanisms, would provide adequate protection for GRSG and its habitat (USFWS 2010); however, universal implementation remains uncertain due to the variety in landownership and management (Manier et al. 2013).

The Wyoming executive order applies to state trust lands starting in 2008. These trust lands cover almost 23 percent of GRSG habitat and benefit approximately 80 percent 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 (Wyoming Executive Order, June 2, 2011).

In Core Areas, there is a 0.6-mile no surface occupancy (NSO) buffer around occupied leks and restrictions on activities in breeding and winter concentration habitat. Wyoming's Industrial Siting Council, which permits large development projects on all lands in the state, is subject to the terms of the executive order. This buffer provides protection for males during lekking season and acts in coordination with the density disturbance cap. The combination of protections could offer GRSG 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 the Core Area Strategy suggests that with effective enforcement statewide, the strategy could reduce population losses by 9 to 15 percent across Wyoming. Moreover, the number of Core Areas predicted to maintain 75 percent of their current populations could increase from 20 to 25 under long-term scenarios (Copeland et al. 2013). Combining the Core Area Strategy with $250 million in target conservation easements (provided willing landowners and funding are available) could reduce population declines by another 9 to 11 percent (Copeland et al. 2013).

In BLM planning areas in Wyoming, however, the Core Area Strategy may be less protective than in other areas, because much development in GRSG habitat has already occurred and populations are already in decline. As stated in the Viability Analysis for Conservation of Greater Sage-Grouse Populations for the Buffalo Field Office (Taylor et al. 2012), Core Areas in northeastern Wyoming were delineated only after widespread development had already occurred in GRSG habitat, leaving few options for conserving populations in this region.

Core Population Areas in Wyoming also incorporate connectivity corridors (Wyoming Executive Order 2011). These are areas GRSG use to maintain connectivity between habitat areas (Manier et al. 2013). Connectivity reduces isolation, thereby increasing viability of a population and reducing vulnerability to disease, drought, or other events that may result in extirpation.

Umbrella Candidate Conservation Agreement with Assurances for Wyoming Ranch Management

Candidate Conservation Agreements with Assurances are voluntary conservation agreements between the USFWS and one or more federal or private partners (e.g., ranchers). In return for managing lands to benefit GRSG, landowners receive assurances against additional regulatory requirements should GRSG be listed under the Endangered Species Act. Within Wyoming, the USFWS and Wyoming Governor's Office in conjunction with the BLM, Natural Resources Conservation Service, Forest Service, and other agencies, have developed an umbrella Candidate Conservation Agreement with Assurances 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 GRSG habitat; and within 24 months develop and implement a written grazing management plan to maintain or enhance the existing plant community as suitable GRSG habitat (USFWS et al. 2013).

Montana Statewide Efforts

The Montana Department of Fish, Wildlife and Parks (MFWP) is tasked with implementing the range-wide WAFWA Sage-Grouse Strategy (Stiver et al. 2006) in Montana. The WAFWA Sage-Grouse Strategy monitors researches, provides outreach, and funds conservation projects for GRSG. 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 GRSG conservation.

In addition, the MFWP's Montana Management Plan and Conservation Strategy for Sage-Grouse was initiated in 2005 to protect, maintain, and restore GRSG 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 GRSG 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 GRSG 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 GRSG 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 active leks in Core Population Areas for oil and gas development
- A minimum 0.6 mile avoidance zone for power lines and communication towers in Core Population Areas
- A minimum 2.0 mile buffer from lek perimeter for main roads and 0.6 mile buffer for facility site access roads
- A 5 percent limit on anthropogenic surface disturbance
- Limits on activity during nesting season in Core Population Areas

The approach of the Montana plan 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 GRSG during nesting, brood-rearing, and winter concentration activities. The timing restrictions would reduce the potential for displacement or disruption during the breeding season.

North and South Dakota Statewide Efforts

The North Dakota Game and Fish Department has developed its Management Plan and Conservation Strategies for Greater Sage-Grouse in North Dakota (Robinson 2014). The purpose of the plan is in part to meet the objectives outlined in the COT report (USFWS 2013), which include:

- Stop population declines and habitat loss
- Implement targeted habitat management and restoration
- Develop and implement GRSG conservation strategies and associated actions and regulatory mechanisms
- Develop and implement proactive, voluntary conservation actions
- Develop and implement monitoring plans to track success of conservation strategies
- Prioritize, fund, and implement research to address existing uncertainties

Similar to the South Dakota plan, the North Dakota plan does not address disturbance caps or impose required restrictions but instead is intended to provide biological information on GRSG in North Dakota and be used as the conservation framework to minimize impacts to GRSG in North Dakota across all land ownerships.

South Dakota finalized a State Sage-Grouse Plan in 2014. While the plan does not address disturbance caps or impose restrictions that are required, it is designed to provide biological information about sage-grouse, identifies factors that influence sage-grouse in South Dakota, and guides future management direction and actions by establishing objectives to:

- Maintain or increase/improve the existing status and range of sage/steppe habitat in South Dakota;
- Use results from lek counts and inference from past hunting seasons to guide recommendations for the annual hunting season;
- Annually monitor sage-grouse population status and distribution
- Use results from lek counts and inference from past hunting seasons to guide recommendations for the annual hunting season;
- Develop a public outreach and educational plan that informs the public, landowners, stakeholders, and wildlife/conservation agencies on sage grouse management and the issues of highest concern;
- Support local, interstate and interagency sage-grouse research projects and collaborative conservation planning efforts; and
- Document disease outbreaks and develop management responses (South Dakota Wildlife Division 2014).

Powder River Basin Restoration Program

The Powder River Basin Restoration Program is a collaborative partnership to restore and enhance GRSG 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 percent private lands, 14 percent BLM-administered lands (including 8 percent in Wyoming and 6 percent in Montana), 8 percent National Forest System lands, and 8 percent States of Wyoming and Montana lands. Split-estate mineral ownership is 50 to 60 percent federal (BLM 2015).

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 GRSG. This includes multiple sites affected by coal bed natural gas 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 GRSG 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 Natural Resource Conservation Service's (NRCS) Sage-Grouse Initiative (SGI) is working with private landowners in 11 western states to improve habitat for GRSG (Manier et al. 2013). With approximately 31 percent of all sagebrush habitats across the range in private ownership (Stiver 2011, p. 39), and over 65 percent in MZ I (Manier et al. 2013, p. 118), a unique opportunity exists for the NRCS to benefit GRSG and to ensure the persistence of large and intact rangelands by implementing the SGI (USFWS 2010, p.5). Local conservation districts in MZ I, such as the Lake DeSmet Conservation District (in the BLM's Buffalo Field Office RMP planning area), have been very active in GRSG conservation.

Participation in the SGI program is voluntary, but willing participants enter into binding contracts or easements to ensure that conservation practices that enhance GRSG 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 NRCS 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 GRSG 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 over 455,000 acres across the GRSG range (NRCS 2015), with the largest percentage of easements occurring in Wyoming (approximately 200,000 acres). In MZ I, SGI has thus far secured conservation easements on 65,881 acres that maintain intact sagebrush-grassland habitat. It has also accomplished the following:

- Established grazing management programs on 1,370,000 acres to enhance GRSG habitat and sustainable ranching
- Removed conifers encroaching on 181 acres of GRSG habitat
- Seeded over 7,500 acres with native plants
- Marked over 350 miles of fences

Other Regional Efforts

Across the Greater Sage-Grouse range, other BLM and Forest Service sub-regions are undergoing RMP revision or amendment processes similar to this one for the Miles City planning area. The Final EIS associated with each of these efforts has identified a Proposed Plan that meets the purpose and need of conserving, enhancing, and/or restoring GRSG habitat by reducing, eliminating, or minimizing threats. The management actions from the various Proposed Plans will cumulatively decrease the threat of GRSG habitat loss and will limit fragmentation throughout the range. Key actions present in many of the Proposed Plans 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 GRSG habitat.

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 GRSG 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 GRSG. At the time of this RMPA specific conservation measures for protecting GRSG and its habitat under the programmatic EIS are not developed.

The United States Forest Service (USFS) is preparing a plan to manage nearly 96,000 acres of GRSG habitat in the Dakota Prairie National Grassland. The plan is not yet available for review but is likely to propose similar protections for GRSG on its lands as are included in the BLM RMPs.

Tribes, counties, and local working groups are playing a critical role in promoting GRSG conservation at the local level. Individual conservation plans have been prepared by most local working groups to develop and implement strategies to improve or maintain GRSG habitat and reduce or mitigate threats on the local level. The proposed conservation actions and recommendations in these plans are voluntary actions for private landowners. Local working group 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 GRSG through increased monitoring and public awareness.

Some local working group conservation plans recommend restricting resource uses as well. For example, the Bates Hole/Shirley Basin Conservation Plan (Bates Hole/Shirley Basin Sage-grouse Working Group 2007) recommends that areas within 3.4 miles of an occupied GRSG lek not be leased for oil and gas development unless mitigation plans have been developed, approved, and funded. Local working group GRSG conservation plans in MZ I include the following:

- Bates Hole/Shirley Basin (Bates Hole/Shirley Basin Sage-grouse Conservation Plan; 2007)
- Big Horn Basin (Sage-Grouse Conservation Plan for the Big Horn Basin, Wyoming; 2007)
- Northeast Wyoming (Powder River Basin) (Northeast Wyoming Sage-grouse Conservation Plan; 2014)
- Glasgow (A Summary of Conservation Activities of the Glasgow, MT Sage-Grouse Local Working Group; 2011)
- Miles City/Forsyth (Miles City Sage-Grouse Local Working Group Action Plan 2011-2014)
- Central Montana Organized Conservation District (no local conservation plan)
- North Dakota (no local conservation plan)
- South Dakota (no local conservation plan)

The Miles City field office of the BLM solicited a viability analysis for GRSG (Taylor et al. 2010). This analysis examined the cumulative impact of multiple stressors on GRSG populations and the varying scales at which these stressors operated. The viability analysis noted that eastern Montana provides habitats that support focal populations of GRSG, but the recent surge in agricultural tillage and energy development has resulted in rapid, large-scale changes in habitat. Energy development impacts were detectable at large scales, while impacts from conversion to agriculture (tillage) were more localized.

Because tillage has heretofore been less prevalent in MZ I, its impacts are harder to assess. The combination of multiple stressors acting at multiple scales could magnify impact on GRSG populations in focal areas (Taylor et al. 2010). The viability analysis for Miles City informed this CEA.

RELEVANT CUMULATIVE ACTIONS

This cumulative effects analysis considers the incremental impact of the MC PRMP/FEIS alternatives in combination with other past, present, and reasonably foreseeable future federal and non-federal actions on all lands in MZ I. Where these actions occur within GRSG habitat, they would cumulatively add to the impacts of BLM-authorized activities set forth in the MC PRMP/FEIS. In addition to the conservation efforts described above, relevant reasonably foreseeable future actions occurring on federal, private, or mixed land ownership in MZ I are described in the North Dakota, South Dakota, Buffalo, Lewistown, HiLine, Billings, and Wyoming GRSG Planning Area RMPs.

The following list includes past, present, and reasonably foreseeable future actions in MZ I that when added to the Proposed Plan and alternatives for the MC planning area could cumulatively affect GRSG (see Table K 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
- Increased oil and gas production surrounding the established fields in the southern Williston Basin
- 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
- Western Area Power Administration 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 projects throughout MZ I

THREATS TO GRSG IN MANAGEMENT ZONE I

The COT Report identifies the present and widespread threats facing GRSG in MZ I as energy development, infrastructure, grazing, conversion to agriculture, fire, spread of weeds, and recreation (USFWS 2013). These threats impact GRSG mainly by fragmenting and degrading their habitat. The loss of sagebrush steppe across the west is a primary factor in long-term declines in GRSG 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 2012b). Sensitive species such as GRSG, 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 GRSG in the planning area, see Chapter 4 of the Miles City PRMP/FEIS. The quantitative impact analysis focuses on impacts in MZ 1, with planning area acres provided for context.

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 GRSG population trends. For mining, the COT report objective is to maintain stable to increasing GRSG populations and no net loss of GRSG 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 GRSG population, albeit at a lower level than historically (Taylor et al. 2012).

There are approximately 1,004,400 acres of GRSG habitat in MZ I where energy and mineral development (including oil and gas, coal leasing, mineral materials, and locatable 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 or nonenergy leasable mineral development is presently occurring in MZ I. Impacts from these activities would be similar to other types of mining and energy development. However, since these resources are not present in the MZ, restrictions related to the development of these resources have no impact on GRSG populations.

Oil and Gas

Nature and Type of Effects

Oil and gas development has emerged as a range-wide issue in conservation because areas being developed contain large GRSG populations (Connelly et al. 2004) and other sagebrush obligate species (Knick et al. 2003). As discussed in Chapter 4, oil and gas development impacts GRSG 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 direct mortality from vehicle strikes and disturbance from noise. Oil and gas development also indirectly impacts GRSG through the species' avoidance of infrastructure due to increased noise and vehicle traffic associated with development This development can also impact GRSG survival or reproductive success. Other indirect effects include 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 GRSG populations are affected at oil and gas well densities commonly permitted in Montana and Wyoming in the past (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 percent. These and other studies demonstrate that both direct and indirect impacts result from the impacts of energy development and geophysical exploration in GRSG 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. 2007a). Walker et al. (2007a) found that in the Powder River Basin buffer sizes of 0.25, 0.5, 0.6, and 1.0 mile resulted in an estimated lek persistence (the ability of leks to remain on the landscape) of approximately 5, 10, 15, and 30 percent; conversely lek persistence in areas without oil and gas development averaged approximately 85 percent.

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 5 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 percent (Doherty 2008).

Much oil and gas development previously occurred on private lands with minimal mitigation efforts, but restrictions are now in place to protect GRSG habitat under the Wyoming and Montana executive orders (though the Montana executive order still requires funding for implementation). Earlier research had demonstrated that 0.25-mile NSO lease stipulations were insufficient to conserve breeding GRSG populations in a typical landscape in portions of the planning area (Walker et al. 2007a), when nearly 80 percent 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 GRSG in excess of approximately 2 miles of construction activities. GRSG 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 GRSG 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

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). Energy development is a widespread threat to GRSG in the Miles City RMP planning area and the neighboring areas. The patchwork landownership pattern in MZ I means that many energy extraction facilities are near property boundaries and may affect GRSG and their habitat on adjacent lands. Nearly 16 percent of GRSG 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 percent of PHMA and GHMA across MZ I, occurring to a distance of 12 miles from the development. Private surface lands account for 65 percent of wells in PHMA and 72 percent in GHMA in MZ I (Manier et al. 2013). Thus, conservation actions on private land are likely to have

a greater potential to reduce the adverse impacts of oil and gas development on GRSG habitat than any other single land management entity.

Although oil and gas activities have a disproportionately greater effect on private lands, 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 GRSG habitat occurring on private surface lands that would not be required on lands with both privately held surface and subsurface.

From 2001 to 2005, GRSG populations declined by 82 percent within the expansive coal bed natural gas fields (Walker et al. 2007a) in northeast Wyoming. Within the Miles City planning area, energy development is less widespread than in Wyoming. Within GRSG habitat in the Miles City planning area, 267,000 acres of federal fluid minerals (83,000 BLM-administered surface acres) are considered to be high potential for oil and gas development and 718,000 acres of federal fluid minerals (370,000 BLM-administered surface acres) are in areas with medium potential for oil and gas development.

The Powder River Basin has had extensive development of coalbed natural gas in the last 10 to 15 years, fragmenting GRSG habitat throughout that area. With a well life of approximately 12 years, many of the coal bed natural gas wells that were originally drilled are depleted and ready for abandonment. Native vegetation over most buried pipelines has reclaimed its predisturbance composition. Utility roads and overhead power lines continue to degrade thousands of acres of GRSG habitat on private, federal, and state lands resulting in avoidance of otherwise suitable habitat (BLM 2013b).

Though the BLM may restrict future leasing for oil and gas on Federal fluid mineral estate that it administers in GRSG habitat, existing leases remain valid unless they have already been developed, at which point they are valid for the life of the producing well. Any new development of wells on existing leases is subject to Conditions of Approval to avoid other resource damage, including GRSG.

The Powder River Basin contains substantial energy resources, including oil, natural gas, and coal bed natural gas (USFWS 2013, pp. 64-65); conversely, the northern Montana population has less energy development. Coal bed 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 coal bed natural gas drilling in the Powder River Basin has concluded, and current and future oil and gas development is anticipated to impact GRSG less due to horizontal drilling technology.

Impact Analysis

Tables B and C provide a quantitative summary of present fluid mineral leasing conditions on BLM-administered lands under the Miles City PRMP/FEIS alternatives and across MZ I, and an analysis of past, present, and reasonably foreseeable actions in MZ I (see Table K). As stated in the assumptions, the tables are limited to BLM-administered lands and reflect the conditions assuming implementation of the Proposed Plans of the other planning areas in MZ I. Tables displaying fluid mineral acreage include the federal mineral estate as well as BLM-administered surface acres.

As shown in Tables B and C, the Miles City RMP planning area exerts a relatively large influence within the broader MZ because it comprises a large portion of MZ I (note that all acreages assume implementation of the Proposed Plans in each of the other RMP planning areas in MZ I). Acreage closed to fluid mineral exploration under Alternative A is higher than under other alternatives due to a court order in the Powder River Basin (outside the planning area) barring new leasing until the impacts of leasing are examined. The publication of BLM RMPs in the Powder River Basin will re-open the area to new leases. The Miles City Proposed Plan closes relatively few acres to leasing but relies on NSO stipulations across all BLM fluid mineral estate within PHMA and within 0.6 miles of a lek in GHMA to protect GRSG habitat.

Alternative B would provide the greatest protection to GRSG on BLM-administered land across the MZ by closing PHMA to new leases and placing more acres under NSO stipulation. NSO restrictions would cover more acres of PHMA and GHMA than any other alternative. Closures and NSO stipulations would have similar effects: both would reduce well density and impacts associated with construction and operation on BLM-

administered land. The extensive closures and stipulations under this alternative could affect pending oil and gas development projects. One example is the Greater Crossbow Exploration and Development Project, which proposes to develop 1,500 wells over ten years. Implementation of Alternative B may push development and associated impacts onto private lands where protections are less stringent.

Acres open and closed to oil and gas leasing under Alternatives C and D are approximately the same and both alternatives propose more acres of NSO and CSU/TL stipulations than current management. While not as protective as Alternative B, these two alternatives may provide enough flexibility that development will not simply be pushed onto other lands. This may provide a more consistent development footprint across the MZ and not concentrate impacts on GRSG on certain land management types.

The action alternatives would all reopen the Powder River Basin to leasing, much of which is currently closed to new leasing by court order. Application of NSO or CSU/TL stipulations, in conjunction with similar measures under the Wyoming and Montana state plans, would reduce impacts on GRSG from future leasing in this area.

The Miles City RMP/EIS Mitigation Guidelines in, the Greater Sage Grouse (GRSG) Required Design Features Appendix, would help protect unfragmented habitats, minimize habitat loss and fragmentation, and maintain conditions that meet GRSG life history needs. For example, remote telemetry (e.g., monitoring oil and gas operations) would be used to reduce vehicle traffic, disturbance areas would be kept to a minimum, and vegetation would be removed only when necessary.

TABLE B.
ACRES OPEN* AND CLOSED TO FLUID MINERAL LEASING IN GRSG 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	500,000	100%	3,502,000	43%
Alternative B	77,000	100%	2,148,000	7%
Alternative C	81,000	100%	2,472,000	19%
Alternative D	65,000	100%	2,664,000	25%
Proposed Plan	0	0%	2,642,000	25%
Closed to Fluid Mineral Leasing				
Alternative A	186,000	1%	1,771,000	94%
Alternative B	2,270,000	92%	603,000	81%
Alternative C	214,000	14%	591,000	81%
Alternative D	214,000	14%	592,000	81%
Proposed Plan	184,000	0%	157,000	27%

Source: BLM 2015
***Open with standard lease terms and conditions. This table displays the acres of PHMA and GHMA open with standard stipulations (i.e., without NSO, CSU, or TL stipulations) and closed to fluid mineral leasing in MZ I; it also displays the percentage of those acres that are found within the planning area. This percentage assumes implementation of the Proposed Plans in the other planning areas of MZ I. Table C displays acreage with protective stipulations applied.**

TABLE C.
ACRES WITH NSO AND CSU/TL STIPULATIONS IN GRSG 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	2,367,000	3%	1,046,000	19%
Alternative B	2,550,000	10%	2,290,000	63%
Alternative C	2,351,000	2%	970,000	13%
Alternative D	2,330,000	1%	858,000	2%
Proposed Plan	3,626,000	36%	1,281,000	34%
CSU/TL Stipulations				
Alternative A	2,334,000	27%	4,883,000	28%
Alternative B	1,773,000	4%	4,284,000	18%
Alternative C	2,831,000	40%	6,202,000	43%
Alternative D	2,675,000	36%	6,313,000	44%
Proposed Plan	1,707,000	0%	5,251,000	33%

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. This percentage assumes implementation of the Proposed Plans in the other planning areas of MZ I.

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.

Implementing any alternative under the Miles City RMP would not affect pending or future oil and gas development projects outside of the planning area. For example, the Converse County Oil and Gas Project proposes to drill approximately 5,000 oil and natural gas wells in an area encompassing 1.5 million acres (including GRSG core habitat) in MZ I. However, the NSO buffer and the disturbance caps under the Wyoming and Montana Executive Orders would reduce the threat to GRSG from oil and gas development on non-federal lands in those states in MZ I.

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 GRSG less than coal bed natural gas development has in the past decade. While applying stipulations and closing areas to leasing would reduce impacts on federal mineral estate, the application of lek buffers and disturbance limitations would reduce, but likely not eliminate, impacts. Reasonably foreseeable oil and gas development is widespread in the MZ. When the impacts of the Miles City RMP are added to these actions, the impact would be a net conservation gain under the Proposed Plan due in large part to implementation of NSO stipulations, anthropogenic disturbance caps, and adaptive management that would minimize future disturbances to GRSG populations and habitats,

Although protections would not be as stringent as under Alternative B, implementation of the Miles City Proposed Plan in conjunction with other BLM RMP proposed plans and past, present, and reasonably foreseeable future actions in MZ I would provide a net conservation gain to GRSG. Specific measures driving this conclusion include RDFs on existing leases, establishing 0.6-mile lek buffers in accordance with the Montana Executive Order, and implementing NSO and CSU/TL stipulations on new leases.

Coal

Nature and Type of Effects

Past and current coal extraction has been and continues to be a major mining activity in MZ I. Approximately 3 percent of BLM-administered PHMA in MZ I and 8 percent of GHMA is influenced by coal mining (Manier et al. 2013). Surface mining accounts for about 67 percent of production in the United States; large mines can cover many square miles. Coal mining and the use of coal to produce electricity has environmental impacts. These are soil erosion, dust, noise, water pollution, acid-mine drainage, and air emissions, in addition to impacts on wildlife in the area and contributions to climate change (Manier et al. 2013, pp. 69-71).

Conditions in MZ I

The Powder River Basin in Wyoming and Montana 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 forecasts for the Powder River Basin through 2020 indicate total production is expected to grow at an annual rate of 2 to 3 percent. This is consistent with electric power demand. Interest and demand for new leasing is expected to continue through 2020, based on forecasting. The preliminary work for the 2030 forecast indicates a slower rate of increase in the Powder River Basin, 0.25 to 2 percent. This is based on reduced coal demand, new natural gas discoveries, and possible regulation of greenhouse gases. By 2030 the BLM expects Powder River Basin coal production to be between 500 and 700 million tons annually, though more recent projections indicate lower coal demand because of increased supply of natural gas.

Coal surface leases indirectly influence 3 percent of PHMA and 8 percent of GHMA across MZ I. Coal is estimated to impact habitat to a distance of 12 miles from the direct impact area (Manier et al. 2013). Approximately 68 percent of coal leases in PHMA and 82 percent in GHMA occur on private lands in MZ I but may contain federal mineral estate (Manier et al. 2013). Protective stipulations would be of particular benefit on privately owned surface and subsurface lands where the BLM's protective regulatory mechanisms would not apply.

Impact Analysis

The reasonable foreseeable development (RFD) scenario in the Miles City Draft RMP/EIS suggests that the development of coal resources in the planning area would not vary considerably across alternatives. Furthermore, areas considered suitable for leasing will not necessarily be leased; the actual amount of leasing depends on factors such as price and regulatory safeguards.

Alternative B would designate few acres of GRSG habitat as suitable within MZ I, while Alternative C and D would designate more acreage as suitable, compared to current management. However, the Proposed Plans across MZ I would assess coal lease applications for suitability on a case-by-case basis, with PHMA considered essential habitat for GRSG. As a result, coal leasing and development, and its associated impacts, within PHMA would be less likely under the Proposed Plans in MZ I.

Coal development that requires state agency review or approval would be subject to the permitting process and stipulations for development in GRSG Core areas under the Wyoming and Montana executive orders, as well as BLM review under the Proposed Plan. However, there are no coal leases in WY Core Areas; however there are Core areas in the Miles City planning area with active and pending coal leases and mines.

New coal lease applications on federal mineral estate would be subject to 43 CFR Part 3461.5(o)(1), Criterion 15. This criterion states that a lease may be issued if, after consultation with the state, the surface management agency determines that all or certain stipulated methods of coal mining would not have a significant long-term impact a. "resident species of fish, wildlife, and plants of high interest to the state" such as GRSG. Special conditions would be required, as identified during the leasing process, to protect GRSG habitat. The requirements of 43 CFR, Part 3461.5, Criterion 15, in combination with BLM planning efforts and state plans, and other past, present, and reasonably foreseeable future actions, would help reduce the threat from coal extraction and provide a net conservation gain to GRSG 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 GRSG 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 MZ I. They are primarily located in northeast Wyoming. 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. Indirect effects are estimated to 1.5 miles out from the direct effects area. (Manier et al. 2013). The mineral materials currently being developed for commercial purposes in the Miles City planning area consist primarily of aggregate (sand, gravel, and clinker).

Across MZ I, PHMA and GHMA are most affected by mining and mineral materials disposal sites on private land surface. GRSG 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 percent of PHMA and 80 percent of GHMA 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 percent of PHMA and 11 percent of GHMA (Manier et al. 2013).

Impact Analysis

Closures or restrictions on mineral material development in the planning area would reduce adverse effects on GRSG from mineral material development on BLM-administered surface and split-estate lands. However, these actions may shift development onto non-federal lands, with potentially greater impacts on GRSG because protective stipulations and permit requirements would not apply.

Acres of PHMA and GHMA open to mineral material disposal in MZ I would be similar under Alternatives A through D. These alternatives would not increase protection of GRSG and their habitat compared to current management.

The Proposed Plan provides the most protection to GRSG from mineral material disposal in PHMA and GHMA, especially by closing PHMA to mineral materials disposal in the planning area except for free use permits. As a result, the Proposed Plan would reduce impacts more than any other alternative and would provide the greatest conservation benefit to GRSG.

Under the Wyoming and Montana Executive Orders, authorizations of new mineral material disposal sites that require state agency review or approval would be subject to the GRSG permitting process. They also would be subject to stipulations for development in GRSG Core areas. These stipulations would be of particular benefit on privately owned surface and subsurface lands, where BLM protective regulatory mechanisms do not apply.

Overall, the combination of BLM management actions for mineral materials development in the Proposed Plan for the Miles City RMP, the Wyoming and Montana state actions, and other planned restoration activities would preserve more habitat from disturbance than current management, reduce disturbance to birds, and in combination with other past, present and reasonably foreseeable future actions, provide the greatest net conservation gain to GRSG in MZ I.

TABLE D
ACRES OPEN AND CLOSED TO MINERAL MATERIAL DISPOSAL IN GRSG 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	2,998,000	38%	8,801,000	35%
Alternative B	4,200,000	56%	8,401,000	32%
Alternative C	3,043,000	39%	9,257,000	38%
Alternative D	2,877,000	39%	9,423,000	39%
Proposed Plan	1,845,000	0%	8,421,000	32%
Closed to Mineral Material Disposal				
Alternative A	2,570,000	0%	686,000	10%
Alternative B	2,568,000	0%	650,000	5%
Alternative C	2,602,000	1%	645,000	4%
Alternative D	2,602,000	1%	645,000	4%
Proposed Plan	3,865,000	34%	700,000	12%

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.

Locatable Minerals

Nature and Type of Effects

Locatable minerals include gold, silver, uranium, 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 GRSG PH and GH.

As with fluid mineral development, reclamation practices may help to reduce long-term impacts on GRSG 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 GRSG populations. Even with effective restoration, restored areas may not support GRSG populations at the same level as prior to disturbance.

Conditions in MZ I

The primary locatable minerals in commercially viable quantities in the Miles City planning area are sodium bentonite and uranium. The South Carter Restoration Area is affected by bentonite mining and will continue into the foreseeable future. Expansion of bentonite mining in this area is currently pending (see Table K). Other

locatable minerals such as gold and zinc exist in the planning area, but are currently uneconomical to produce. Most current and forecasted extraction activities in MZ I are for bentonite, but uranium is also being mined. In the event of a price increase, uranium mining activity would likely increase in GRSG habitat.

Impact Analysis

As shown in Table E, quantitative data on the number of acres of GRSG habitat recommended for withdrawal in MZ I are limited. However, the data represent a relatively small influence, compared to the broader MZ. However, withdrawals in the planning area would still influence the threat on a MZ-wide scale.

Apart from the proposed Plan, under Alternative B the least acreage would be open to locatable mineral entry in PHMA and GHMA, compared to current management. This is because under Alternative B, all habitat within 4 miles of a lek is recommended for withdrawal from mineral entry. If locatable mineral resources were present in the decision area, this management could push development onto other lands, but in the absence of these resources, management changes would have little impact. The Montana and Wyoming state plans count locatable mineral development against their disturbance caps, meaning future development could trigger adaptive management protections for GRSG. Because Alternative B would restrict future locatable mineral operations on GRSG habitat more than other alternatives, it would provide more protections to GRSG habitat from locatable mineral development if such development were likely in the planning area.

TABLE E.
ACRES OPEN AND RECOMMENDED FOR WITHDRAWAL FROM MINERAL ENTRY IN GRSG 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 Mineral Entry				
Alternative A	4,429,000	26%	8,819,000	30%
Alternative B	3,534,000	7%	8,272,000	25%
Alternative C	4,472,000	27%	9,040,000	32%
Alternative D	4,316,000	24%	9,197,000	33%
Proposed Plan	4,080,000	20%	7,190,000	14%
Recommended for Withdrawal from Locatable Mineral Entry				
Alternative A	1,085,000	0%	118,000	0%
Alternative B	3,104,000	65%	118,000	0%
Alternative C	1,085,000	0%	118,000	0%
Alternative D	1,085,000	0%	118,000	0%
Proposed Plan	1,085,000	0%	118,000	0%

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.

Alternative C and D do not recommend withdrawal of any additional acres of GRSG habitat from locatable mineral development, and impacts from BLM management would be the same as Alternative A. Sodium bentonite extraction and other forms of locatable mineral mining would continue to affect GRSG through

habitat loss and degradation. Alternative C or D would not provide any net conservation gain to GRSG, compared to Alternative A.

Under all alternatives, the required design features outlined in the GRSG Required Design Features Appendix would help minimize the impacts on GRSG from locatable mineral development on federal land. For example, locating new facilities outside of PHMA would reduce noise disturbance. Clustering operations and facilities as closely as possible and placing new infrastructure in already disturbed locations would reduce impacts on sagebrush habitats.

The disturbance cap in the Proposed Plan would not block locatable mineral entry projects, but any locatable mineral entry would be considered as disturbance under the cap and would trigger adaptive management and associated benefits for GRSG if overall disturbance limits were exceeded. Overall, the measures in the Proposed Plan would help alleviate the threat, and in light of state plans, other BLM planning efforts, and other past, present, and reasonably foreseeable future actions, provide a net conservation gain to GRSG throughout MZ I.

Infrastructure

The USFWS (2013) considers energy development and associated infrastructure the largest threats to GRSG in MZ I. The COT Report objective is to avoid development of infrastructure in GRSG priority areas for conservation. However, in the Powder River Basin, considerable infrastructure has already been constructed in GRSG habitat, making it necessary to focus GRSG management on minimizing impacts of infrastructure.

Rights-of-Way

Nature and Type of Effects

As discussed in Chapter 4, power lines can directly affect GRSG 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, is widespread throughout MZ I. In some locations, infrastructure development has affected GRSG habitat. Development of roads, fences, and utility corridors has also contributed to habitat loss and fragmentation in portions of MZ I. The best available estimates suggest about 16 percent 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 percent of MZ I within 4 miles of a road, 30 percent within 4 miles of a power line, and 4 percent within 4 miles of a communication tower (Knick et al. 2011). In the planning area most ROWs on BLM-administered lands are associated with oil and gas development, electrical transmission, irrigation ditches, and communications, as well as transportation projects such as the Tongue River Railroad.

Although not representative of all infrastructure ROWs, transmission lines greater than 115 kilovolts indirectly influence 29 percent of PHMA and 46 percent of GHMA across MZ I. Indirect effects are assumed to occur to a radius of 4 miles (Manier et al. 2013). Approximately 68 percent of transmission lines in PHMA and 73 percent in GHMA are on private lands across GRSG 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 GRSG habitat than any other land management entity. Designating ROW exclusion and avoidance areas in PHMA and GHMA on BLM-administered lands could reduce the threat on these lands; however, the scattered federal

landownership encourages routing infrastructure around federal lands, often increasing its length and impact. ROW avoidance and exclusion areas on BLM-administered lands could increase this tendency.

Impact Analysis

Table F lists the areas of ROW avoidance and exclusion in GRSG habitat by alternative. Alternative A, (current management) has the most acres open to ROWs in PHMA and GHMA. The other alternatives all substantially reduce the number of open acres, compared to Alternative A. For ROW exclusion, Alternative B excludes ROWs in PHMA and its acreage is greatly increased over the other alternatives, including current management.

The Proposed Plan relies more on ROW avoidance than exclusion to protect GRSG habitat, with acreages comparable to those under current management. The avoidance approach preserves management flexibility in situations where landownership is mixed. Flexibility is especially beneficial to GRSG leks and habitat in areas where rerouting ROWs across nonfederal land may result in more impacts on GRSG than direct routing across federal land.

TABLE F.
ACRES OF RIGHTS-OF-WAY DESIGNATIONS IN GRSG 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				
Alternative A	670,000	99%	2,475,000	66%
Alternative B	92,000	95%	1,056,000	20%
Alternative C	113,000	96%	1,740,000	51%
Alternative D	85,000	94%	2,217,000	62%
Proposed Plan	5,000	0%	932,000	9%
Right-of-Way Exclusion				
Alternative A	132,000	10%	127,000	19%
Alternative B	1,357,000	91%	1,202,000	91%
Alternative C	127,000	6%	969,000	89%
Alternative D	119,000	0%	659,000	84%
Proposed Plan	119,000	0%	148,000	31%
Right-of-Way Avoidance				
Alternative A	2,634,000	0%	977,000	1%
Alternative B	2,634,000	0%	978,000	1%
Alternative C	3,223,000	18%	1,008,000	4%
Alternative D	3,118,000	16%	981,000	1%
Proposed Plan	3,449,000	24%	2,363,000	59%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within rights-of-way designations in MZ I; it also displays the percentage of those acres that are found within the planning area.

The numbers of ROW authorizations are anticipated to grow across the MZ. Increasing populations, continued energy development, and new communication sites drive the need for new ROWs on BLM-administered lands and those lands not under BLM administration. There would be fewer ROWs under the Proposed Plan because of the anthropogenic disturbance cap that would limit development over the long-term. This would provide the greatest net conservation gain to GRSG.

New ROW authorizations that require state agency review or approval would be subject to the permitting process and development restrictions, including the disturbance cap, in GRSG Core Areas under the Proposed Plan, and also under the Wyoming and Montana executive orders, as discussed in **Section 5.1.4**. These stipulations would benefit GRSG in Core Areas by encouraging ROW development outside of Core Habitat Areas, restricting surface occupancy within 0.6 mile of occupied leks, prohibiting power lines greater than 115 kV outside of designated corridors, and locating new roads used to transport products or waste over 1.9 miles from occupied leks. These provisions would reduce disturbance to GRSG populations from human traffic, noise, and increased predation associated with tall structures.

The effect of the alternatives and other conservation actions in the MZ (most notably the Montana and Wyoming executive orders) could be synergistic. By implementing restrictions on infrastructure in PHMA and on state and private lands together, the cumulative beneficial effect on GRSG 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.

In combination with these past, present, and reasonably foreseeable future actions and other BLM proposed plans in MZ I, the Proposed Plan would provide the greatest net conservation gain to GRSG in MZ I. It would accomplish this by providing the flexibility to work in concert with policies on state and private lands to site ROWs in areas with the least impact on GRSG habitat, thereby preserving larger blocks of unfragmented habitat for GRSG populations.

Renewable Energy

Nature and Type of Effects

Impacts on GRSG 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

Solar energy has very low potential, while wind energy development is a growing presence in MZ I, though currently no applications have been submitted in the planning area. Wind turbines currently indirectly influence 1 percent of PHMA and GHMA across MZ I (Manier et al. 2013), but the American Wind Energy Association ranks Montana fifth in the nation for wind-energy potential and the planning area has wind resources consistent with utility-scale production. Approximately 548,000 acres of BLM administered land within the planning area are rated good potential. To date, one wind farm in the Cedar Creek Restoration area has been developed on non-BLM lands.

A programmatic EIS by the Western Area Power Administration (WAPA) and the Department of Energy for the entire upper Great Plains will focus future wind energy developments in specific corridors outside of GRSG Core habitat (WAPA 2013).

Impact Analysis

Table G lists areas of wind energy ROW by alternative.

Private lands account for 72 percent of wind turbines affecting GRSG in PHMA and 87 percent in GHMA 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. Projects that require state agency review or approval would be subject to the Wyoming executive order permitting process. This would encourage wind energy development outside of Core habitat areas and reduce impacts on GRSG in these important areas in Wyoming. There is no ability to regulate wind farm development in the MT executive order permitting process.

In the Miles City planning area Alternative A maintains by far the most acreage in PHMA open to wind energy development. Alternatives C and D, in conjunction with other BLM RMP proposed plans, are relatively similar in terms of their acreage allocations; resulting impacts would likewise be similar. Alternative B would close PHMA to wind energy development. Data are not available for wind ROW avoidance for Alternative B, but Alternatives C and D would both modestly improve acreage compared to current management; impacts on GRSG from wind development, including disturbance and habitat degradation, would be reduced as a result. Protecting GRSG habitat areas would protect existing populations of GRSG.

TABLE G.
ACRES OF WIND ENERGY MANAGEMENT DESIGNATIONS IN GRSG 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				
Alternative A	658,000	100%	2,264,000	71%
Alternative B	78,000	97%	853,000	23%
Alternative C	110,000	98%	1,534,000	57%
Alternative D	82,000	98%	1,980,000	67%
Proposed Plan	2,000	0%	655,000	0%
Wind Right-of-Way Exclusion				
Alternative A	1,998,000	1%	384,000	10%
Alternative B	3,227,000	39%	1,469,000	76%
Alternative C	1,985,000	<1%	1,237,000	72%
Alternative D	1,978,000	<1%	943,000	63%
Proposed Plan	2,793,000	29%	479,000	28%
Wind Right-of-Way Avoidance				
Alternative A	778,000	0%	2,301,000	2%
Alternative B	347,000	0%	889,000	0%
Alternative C	1,367,000	43%	2,316,000	1%
Alternative D	1,260,000	38%	2,306,000	1%
Proposed Plan	776,000	0%	2,285,000	61%

Source: BLM 2015
This table displays the acres of PHMA and GHMA within wind energy management designations in MZ I; it also displays the percentage of those acres that are found within the planning area.

The Proposed Plan would close PHMA to wind energy development and would close the most acres of GHMA of all alternatives. Across the MZ, acres of ROW avoidance and exclusion in GHMA and PHMA would increase compared to current management. This would provide a net conservation gain on BLM-administered lands. Impacts would be minimized on BLM-administered land across all alternatives by adhering to the wildlife protection provisions of the Wind Energy Development Programmatic EIS (BLM 2005). Implementation of wind energy closure in PHMA in the Miles City RMP Proposed Plan, in combination with the disturbance cap under the WY state plan, exclusion zones in other BLM planning areas, the protections in the WAPA EIS, and other past, present, and reasonably foreseeable future actions, would provide a net conservation gain to GRSG 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).

Livestock can influence habitat by modifying plant biomass, plant height and cover, and plant species composition. Changes in plant composition could occur in varying degrees and could change vegetative structure, affecting cover for nesting birds. Changes in plant composition could also cause changes in habitat that alter species abundances and composition in GRSG insect prey. 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 GRSG and negatively affect GRSG recruitment. Improper cattle and sheep also can reduce invertebrate prey for GRSG 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. It often exacerbates drought effects when stocking levels are not quickly reduced to match the limited forage production. 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 improved due to improved grazing management practices and decreased livestock numbers and annual 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.

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). GRSG 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 GRSG habitat.

Livestock grazing could reduce the suitability of breeding and brood-rearing habitat for GRSG populations (USFWS 2010). Reducing grass height in GRSG 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 GRSG, are primary considerations for prioritizing the processing of grazing authorizations. In the Miles City Field Office, all allotments have been assessed and 98 percent were found to be meeting standards. Of the remainder, only 0.01% were not making progress towards meeting Standards.

Improperly designed or located range improvements could result in livestock overusing important GRSG 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; conversely, in areas where livestock use was not well managed, invasive forbs would rise in prevalence.

Allowing spring developments along ephemeral streams and wetlands and allowing livestock watering tanks would decrease GRSG habitat. Springs, seeps, and wetland areas are vitally important to GRSG broods; therefore, allowing spring developments under this alternative could benefit some resources but not GRSG.

On National Forest Systems 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. Impacts on GRSG from complying with these laws are similar to those described for grazing on BLM-administered lands.

Conditions in MZ I

Livestock grazing is the dominant agricultural use in the Great Plains. It is widespread on many land ownerships, 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 grazing, having been grazed by bison before the West was settled (Knick et al. 2011).

Impact Analysis

Table H lists the acres of PHMA and GHMA available and unavailable for grazing in MZ I, by alternative.

Acres open to livestock grazing in PHMA and GHMA vary by less than 20 percent across all alternatives. As a result, acreage allocations by themselves would not cause great variation in impacts on GRSG. Acres closed to livestock grazing would be greatest under Alternative B, which closes PHMA to grazing. This would benefit GRSG by maintaining nesting cover for protection and forage; however, closing acreage to grazing could result in fuels buildup or in increased fencing to exclude grazing animals, which could harm nesting GRSG by increasing the likelihood of predation and collision.

Although the acres closed to livestock grazing are similar under Alternatives A and the Proposed Plan, management and monitoring under the Proposed Plan would place greater emphasis on protective cover of vegetation and litter. The Proposed Plan also includes guidelines on placing salt or mineral supplements near

leks, which would limit trampling damage to habitat, in accordance with the COT Report objectives. This would result in the greatest net conservation gain to GRSG on BLM-administered lands in MZ I.

Because most grazed land in GRSG habitat in MZ I is privately owned, though, restrictions on grazing on BLM-administered land may have limited direct effect on population areas. The NRCS's Sage-Grouse Initiative is protecting privately held ranchlands for GRSG habitat using conservation easements. This program's influence across the MZ is expected to grow, but is currently limited compared to the total number of acres of GRSG habitat.

TABLE H.
ACRES AVAILABLE AND UNAVAILABLE TO LIVESTOCK GRAZING IN GRSG 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	3,435,000	20%	3,542,000	47%
Alternative B	3,994,000	31%	3,075,000	39%
Alternative C	3,463,000	20%	3,669,000	49%
Alternative D	3,323,000	17%	3,812,000	51%
Proposed Plan	3,573,000	23%	3,407,000	45%
Unavailable to Livestock Grazing				
Alternative A	3,000	0%	8,000	0%
Alternative B	157,000	98%	249,000	97%
Alternative C	3,000	0%	11,000	27%
Alternative D	3,000	0%	8,000	0%
Proposed Plan	3,000	0%	8,000	0%

Source: BLM 2015This 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.

If BLM-administered lands were made unavailable for livestock grazing, this could increase grazing pressure on adjacent private lands. Loss of federal grazing permits would pose a threat of indirect adverse effects, including potential conversion of private grazing lands to agriculture, if the loss of federal grazing permits made ranching less economically viable.

As literature suggests that moderate grazing is compatible with GRSG habitat (Strand and Launchbaugh 2013), closing acres to grazing may not itself benefit or harm GRSG. Possibly equally or more beneficial is properly locating or designing range improvements in GRSG habitat, limiting fencing, and meeting range health standards on grazing allotments in GRSG habitat.

The COT Report objectives for livestock grazing are to manage grazing in a manner consistent with local ecological conditions. This management would maintain or restore healthy sagebrush shrub and native perennial grass and forb communities and conserve essential habitat components for GRSG. Restoration to meet these standards and adequate monitoring would be required. The COT Report also states that land managers should avoid or reduce the impact of range management structures on GRSG habitat.

In combination with NRCS actions under the Sage-Grouse Initiative, including fence marking and conservation easements, state efforts to maintain ranchland, and other past, present, and reasonably foreseeable future actions, BLM management actions in the Proposed Plan would provide a net conservation gain to GRSG.

Spread of Weeds

Nature and Type of Effects

As discussed in Chapter 4, invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology. Invasive weeds also may cause declines in native plant populations, including sagebrush habitat, through such factors as competitive exclusion and niche displacement. Invasive plants reduce and may eliminate vegetation that GRSG use for food and cover. Invasive weeds fragment existing GRSG habitat and reduce habitat quality by competitively excluding vegetation essential to GRSG. Invasive weeds can also create long-term changes in ecosystem processes, such as fire cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004).

Roads and recreation can promote the spread of invasive weeds through vehicular traffic. Weed infestations can further exacerbate the fragmentation effects of roadways. Irrigation water has also supported the conversion of native plant communities to hayfields, pasture, and cropland, thus fragmenting sagebrush habitats.

Conditions in MZ I

Spread of invasive plants is less prevalent in MZ I and in the planning area due to its cooler, wetter climate compared to GRSG habitat farther west. Drier, hotter summers promote the spread of cheatgrass and other invasives which establish more slowly in MZ I.

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).

The BLM currently manages weed infestations through integrated weed management: biological, chemical, mechanical, manual, and educational methods. It 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 represents a landscape-level approach across management jurisdictions.

Impact Analysis

Invasive species on BLM-administered lands would be controlled under all alternatives. Increased activity, such as surface disturbance, motorized transportation, and animal and human activity, would increase the chance for the establishment and spread of invasive plants.

Increases in mineral development under Alternatives C and D could increase the presence and spread of invasive weeds. Management actions under Alternative B or the Proposed Plan that place greater limitations on activity near GRSG habitat and leks would reduce the chance of invasive species spread and establishment.

Reductions in mineral development and associated infrastructure under Alternative B would reduce the likelihood for spread of invasive plants. Similarly, limiting OHV use to existing routes under the Proposed Plan would reduce the likelihood of invasive spread from cross-country travel. Future route designations may further restrict invasive spread if routes are closed to motorized vehicle use. The COT Report objective for invasive species is to maintain and restore healthy native sagebrush plant communities.

Relevant cumulative actions that result in surface-disturbing activities would increase the potential for the spread of invasive weeds on both land administered by the BLM and land that it does not administer. 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 GRSG Core habitat areas. They would accomplish this by limiting the spread or establishment of invasive species, particularly on lands that lack BLM protective regulatory mechanisms.

These stipulations, in combination with other state and county noxious weed regulations, and other past, present and reasonably foreseeable future actions, would provide a net conservation gain to GRSG in MZ I under all of the RMP alternatives.

Conversion to Agriculture

Nature and Type of Effects

Converting sagebrush habitat to agricultural use, commonly referred to as sodbusting, causes direct loss of habitat available for GRSG. Habitat loss also decreases the connectivity between seasonal habitats, increasing population isolation and fragmentation. Fragmentation then increases the probability for decline of the population, reduced genetic diversity, and extirpation from stochastic events (Knick and Hanser 2011).

In addition to reducing the land area available to support GRSG, habitat loss and fragmentation also increase the likelihood of other disturbances, such as human traffic, wildfire, and invasive plant spread.

Converting 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.

Biofuel production and high prices for small grains has increased the conversion to cropland of native grasslands or lands formerly enrolled in the Conservation Reserve Program (CRP). This conversion of private lands further emphasizes the importance of BLM-administered lands and associated private grazing lands in maintaining large blocks of native grassland and shrubland habitats suitable for GRSG. Converting native grasslands to agricultural lands not only results in a direct loss of habitats for native wildlife, it fragments remaining habitat.

Conditions in MZ I

The most pervasive and extensive change to the sagebrush ecosystems in MZ I is the conversion of nearly 60 percent of native habitats to agriculture (Samson et al. 2004). Cropland currently covers nearly 19 percent of MZ I and influences approximately 50 to 80 percent of sagebrush in MZ I (Knick et al. 2011).

Regional assessments estimate that 7.2 percent of PHMA and GHMA in MZ I are directly influenced by agricultural development. These same assessments estimate that over 99 percent of PHMA and GHMA 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

The BLM does not convert public lands to agriculture; lands retained under BLM management will not be converted to agriculture. As such, the only direct authority the agency has over conversion to agriculture is through retaining or disposing of lands in the realty program. Disposing of lands could increase the likelihood they will be converted to agriculture, depending on their location and new management authority.

As shown below in Table I, acreages identified for retention vary little in the planning area or in MZ I among the alternatives.

TABLE I.
ACRES IDENTIFIED FOR RETENTION AND DISPOSAL IN GRSG 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	3,312,000	17%	3,169,000	45%
Alternative B	3,835,000	28%	2,913,000	40%
Alternative C	3,370,000	18%	3,243,000	46%
Alternative D	3,300,000	17%	3,314,000	47%
Proposed Plan	3,572,000	23%	3,279,000	47%
Acres Identified for Disposal				
Alternative A	124,000	100%	408,000	60%
Alternative B	247,000	100%	323,000	49%
Alternative C	94,000	100%	471,000	65%
Alternative D	23,000	100%	543,000	70%
Proposed Plan	0	0%	165,000	0%

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 land tenure adjustments could result in GRSG habitat in the planning area being converted to agriculture use, except under Alternative B or the Proposed Plan, which would allow disposal of lands in GRSG habitat with assurances that GRSG habitat would be maintained (e.g., application of a conservation easement). Because it proposes the fewest acres of PHMA and GHMA for disposal, the Proposed Plan would provide the greatest protection for GRSG and their habitat of any alternative. However, under all alternatives, land tenure adjustments require site-specific NEPA analysis and land sales must meet the disposal criteria under applicable law. BLM land tenure adjustments are not anticipated to be a significant contributing element to the threat of agriculture conversion.

Lands identified for disposal in MZ I are typically small isolated parcels that are difficult to manage and do not represent suitable GRSG habitat. Parcels determined to have GRSG habitat value would not likely meet the disposal criteria, unless disposal were seen to benefit GRSG.

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 GRSG habitat areas will continue and will potentially increase. Once converted to cropland, acreage is permanently lost as habitat for GRSG. Fragmentation of habitat from piecemeal conversions of ranchland to tilled cropland can increase disturbance over a large area and cause adjacent areas to become unusable or poor-quality GRSG habitat.

The BLM has no management authority over private land conversions, but management actions on BLM lands may influence the potential for conversion on adjacent private lands (see grazing section above). The loss of habitat on private lands may reduce the effectiveness of conservation actions on adjacent BLM-administered lands because the effects of conversion extend onto adjacent lands and this effect increases as a greater percentage of a landscape is converted from sagebrush habitats to other land uses. Current levels of tillage result in localized impacts that alone, are unlikely to greatly impact a GRSG population, but acting in combination with other stressors, could result in population declines (Taylor et al. 2010).
As a result, cumulative impacts vary relatively little across alternatives, and BLM management may have little impact on alleviating this threat. Restrictions on grazing on federal land could increase agriculture pressure on adjacent private lands. If the loss of federal grazing leases makes ranching economically unviable, the potential conversion of private grazing lands to agriculture would increase. However, the Proposed Plan does not substantially increase acreage unavailable to grazing.

Conversion to agriculture is a major concern in the eastern GRSG range in MZ I, the Dakotas, and Montana. In these areas agricultural conversion is profitable, and patchwork ownership boundaries increase the likelihood of habitat fragmentation. While BLM management may preserve habitat on federal lands, if interspersed private lands are tilled, the entire landscape may be lost as GRSG habitat regardless of BLM conservation actions.

In the future, temperature increases resulting from climate change may increase crop yields, encouraging lands not previously used for agriculture to be converted. Thus, the most protective grazing management the BLM can implement for GRSG habitat is to work to minimize habitat fragmentation and improve quality, by maintaining Rangeland Health Standards on current allotments and encouraging ranchers to maintain herds and adopt conservation enhancements.

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 GRSG, 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 GRSG.

This voluntary program provides private landowners with monetary incentives to protect GRSG habitat, often through conservation easements. As a result, private land containing GRSG 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 landscapes with mixed ownerships to support GRSG. As of 2014, SGI has secured conservation easements on 65,881 acres within MZ 1 and marked or removed 350 miles of fence (NRCS 2015). These efforts, in conjunction with BLM management and other past, present and reasonably foreseeable actions in MZ I, would provide a net conservation gain to GRSG in MZ I.

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. Before recovering, these sites are of limited use to GRSG, 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 GRSG population declines, particularly in the Great Basin. 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. However, cheatgrass establishment after fires in MZ 1 is not currently a concern because resistance to widespread conversion to cheatgrass after fire is generally high throughout MZ 1.

BLM management to prevent or control wildfires can also affect GRSG and habitat. Increased human activity and noise associated with fire suppression in areas occupied by GRSG 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 compared to the Great Basin, with 17 percent of PHMA and GHMA 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 (Manier et al. 2013).

In the planning area, between 1991 and 2011, the BLM responded to 2,012 fires that burned 908,053 acres on USFS-, USFWS- and BLM-administered lands. The Eastern Montana Fire Zone exhibits a very active fire season, with an average annual fire occurrence of 96 fires.

Impact Analysis

Management actions in the Miles City RMP that emphasize wildfire suppression in GRSG habitat would benefit the species by limiting habitat loss in the event of wildfire. For example, Alternative B includes measures that prioritize suppression within four miles of leks, and Alternative D would prioritize suppression within PHMA. Alternatives C and D would continue the use of prescribed fire along with current management (Alternative A). Alternative B would restrict the use of prescribed fire in GRSG habitat, while the Proposed Plan would allow its use if it provided a benefit to GRSG.

Recognition of the importance of sagebrush habitat during interagency wildfire response would benefit GRSG in the event of an unplanned fire. The Wyoming and Montana executive orders emphasize fire suppression in Core population areas, while recognizing other suppression priorities may take precedent. This would benefit GRSG during wildfire planning and response, particularly on lands not administered by the BLM.

The Interagency Standards for Fire and Fire Aviation Operations “Red Book” includes a BMP for GRSG habitat conservation for wildlife and fuels management (BLM 2013a). This document is a supplemental policy or guidance for the BLM, the Forest Service, and the USFWS. This BMP would benefit the GRSG during interagency wildland fire operations by using spatial habitat data and predictive services to prioritize and preposition firefighting resources in critical habitat areas. The Proposed Plan would adhere to the COT Report objective to retain and restore healthy native sagebrush plant communities within the range of GRSG. The coordination of federal, state, and local fire prevention actions and changes in fire management, in addition to other past, present and reasonably foreseeable actions in MZ I, would provide a net conservation gain to GRSG.

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 Special Recreation Permit. The BLM also manages Special Recreation Management Areas (SRMAs) where recreation is a primary resource management consideration.

Recreation on federally administered lands that use the extensive network of double-track and single-track routes have an impact on sagebrush and GRSG. Ecological impacts of roads and motorized trails are 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 GRSG 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 National Forest 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 GRSG 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 percent 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).

Relatively few developed recreation sites are located within the planning area. Big game hunting, fishing, dispersed limited camping, hiking, and off-road travel occur within the area. Recreation demands are anticipated to rise across MZ I in recreationally desirable areas.

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 GRSG behavior (USFWS 2013). Limits on road use under the action alternatives and limits on OHVs would help meet these objectives.

In the Miles City planning area, travel management planning is underway to determine specific routes available for closure; OHV management areas in the RMP provide guidance for these implementation efforts.

Impact Analysis

Table J shows Acres of Travel Management Designations in GRSG Habitat in MZ I.

As shown in Table J, acres in MZ I closed to motorized vehicles would be greatest under Alternative B; acreages under Alternatives C, D, and the Proposed Plan are comparable to current management. As a result of travel management planning, impacts on GRSG from motorized vehicle use would be greatest under Alternative A; impacts would be reduced most under Alternative B. The Proposed Plan's anthropogenic disturbance cap would provide long-term protection for GRSG by limiting future route development in GRSG habitat. A disturbance cap would apply on state lands in Wyoming and Montana, per the state plans. This would help reduce future impacts on GRSG throughout their habitat (instead of protections being limited to BLM-administered lands).

TABLE J.
ACRES OF TRAVEL MANAGEMENT DESIGNATIONS IN GRSG 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%	1,000	100%
Alternative B	0	0%	0	0%
Alternative C	0	0%	0	0%
Alternative D	0	0%	0	0%
Proposed Plan	0	0%	0	0%
Limited				
Alternative A	3,426,000	20%	3,528,000	47%
Alternative B	4,045,000	32%	3,178,000	41%
Alternative C	3,455,000	21%	3,665,000	49%
Alternative D	3,313,000	17%	3,807,000	51%
Proposed Plan	3,563,000	23%	3,394,000	45%
Closed				
Alternative A	5,000	0%	41,000	2%
Alternative B	44,000	88%	48,000	17%
Alternative C	5,000	0%	40,000	0%
Alternative D	5,000	0%	40,000	0%
Proposed Plan	5,000	0%	40,000	0%

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.

SRMAs would be designated under Alternatives B, C, D and the Proposed Plan, with the greatest number of SRMAs under Alternative B. SRMAs allow the BLM to more effectively manage areas for group recreation and could reduce impacts on GRSG by concentrating use in areas away from GRSG habitat.

Implementation of the Proposed Plan, in concert with travel management planning on BLM-administered lands within MZ I, the disturbance caps applied under state plans, and other past, present and reasonably foreseeable

future actions, would help reduce the threats from recreation and travel on GRSG habitats and would provide a net conservation gain to GRSG in MZ I.

CONCLUSIONS

In addition to BLM management in the Miles City planning area and other RMP planning areas in MZ I—North Dakota, South Dakota, Buffalo, Lewistown, HiLine, and parts of Billings and Wyoming—GRSG in MZ I will also be impacted by management and conservation at state, regional, tribal and local levels. This analysis takes into account each alternative in the Miles City RMP in conjunction with state and private initiatives. The analysis assumes that the Proposed Plans would be implemented in the other BLM RMP planning areas in MZ I.

Some of the most important past and present actions benefitting GRSG on private land in MZ I are the conservation easements coordinated by the NRCS SGI with private ranchers. SGI has so far preserved hundreds of thousands of acres of GRSG habitat in Wyoming and tens of thousands of acres in Montana. SGI has also provided fence marking and conifer removal to improve habitat quality. This coordination with private landowners enhances conservation in addition to what BLM management can accomplish on federal lands. Ranchers are also beginning to use Candidate Conservation Agreement with Assurances with the USFWS. Under these instruments, the ranchers voluntarily agree to manage lands to reduce threats to GRSG 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 GRSG range, thus far the agreements have been applied to only a small number of ranches in Wyoming and Montana.
Both Wyoming and Montana have adopted statewide plans to promote GRSG conservation. Wyoming's plan implements a Core Population Area Strategy with well density limitations, timing restrictions and a uniform 5 percent disturbance cap across all landownership types. These measures would improve GRSG population levels if effectively enforced (Copeland et al. 2013). In Montana, a 5 percent limit on anthropogenic disturbance is applied within the Density and Disturbance Calculation Tool examination area (based upon occupied leks within any given Core population area). Other state plans include similar, if sometimes less aggressive, measures to reduce impacts on state lands. The limitations on timing and density of energy development along with the disturbance cap, and BLM management on lands with federal mineral estate, would act in concert to promote GRSG conservation and reduce the impacts from energy development.

However, for northeast Wyoming (and the Powder River Basin GRSG population), the state strategy is less effective. This is because the Core areas were delineated after considerable GRSG habitat had already been disturbed by energy development (Taylor et al. 2012). Montana's plan, published in September 2014, promotes a statewide conservation strategy on private and state lands. It also calls for a 5 percent disturbance cap for GRSG habitat, limits well density, and imposes timing restrictions, similar to the approach in Wyoming. This enhances protection for GRSG across state boundaries and adjacent BLM-administered lands.

Currently neither North Dakota nor South Dakota have a similar plan in place, but these states contain smaller populations of GRSG on the edge of the range. State efforts in Montana and Wyoming that protect the core populations would also help sustain populations in North Dakota and South Dakota, if habitat and environmental conditions continue to support GRSG in those areas.

Habitat restoration is also important for sustaining GRSG populations. For example, the Powder River Basin GRSG population has declined due to widespread energy development. The Powder River Basin Restoration Program envisions large-scale habitat restoration; as drill sites go out of production, they would be reclaimed and restored to pre-disturbance conditions. While not all restored habitat is successfully re-occupied by GRSG, the Powder River Basin Restoration Program anticipates that, as energy development ceases and locations are restored to habitat, GRSG in nearby habitats may recolonize restored areas successively. GRSG are not anticipated to return to the area in pre-disturbance numbers. However, restoration in areas next to core habitat and extant populations and connectivity habitat will expand the available breeding and wintering habitat for GRSG and provide a net conservation gain to the species. Unfortunately it is not possible to accurately predict the impact of other local conservation plans in other portions of MZ I that are voluntary in nature.

According to the COT Report, the Powder River Basin GRSG population is at risk, and the Yellowstone Watershed population at potential risk, of extirpation. Although energy development poses a substantial threat, it acts in conjunction with other threats in MZ I, notable conversion to agriculture (tillage) and west Nile virus, which heavily impacts GRSG and is particularly dangerous in populations already stressed by habitat fragmentation and loss (Taylor et al. 2010; USFWS 2013). The viability analysis for GRSG in the Miles City field office found that declines in populations when faced with combinations of these stressors were more rapid and less recoverable (Taylor et al. 2010). The population viability analysis for Powder River Basin reached similar conclusions (Taylor et al. 2012). However the viability analysis for Miles City also noted habitat restoration opportunities, including the use of properly managed grazing as a valuable tool to maintain viable GRSG habitat.

However, as described in this analysis, the threat from energy development can be managed by coordinated action from BLM RMP Amendments and Revisions and state actions, including disturbance caps to limit loss of GRSG habitat. BLM restrictions on energy development and associated infrastructure in GRSG habitat, and permit requirements for development of federal mineral estate, will help reduce loss and disturbance of GRSG populations. For lands that are already leased, BLM can apply COAs as provisions of drilling permit issuance or renewal. Areas that have already been developed have reduced available GRSG habitat, but restoration is in progress.

The more extreme threat to GRSG in MZ I is from tillage of private ranchlands which are converted to agriculture. As described above, these conversions are attractive to ranchers as crop prices increase and climate conditions support more crops. Once tilled, GRSG habitat is not only lost on the tilled land but surrounding habitat areas become fragmented and less hospitable to birds. Neither BLM management nor the state government can restrict tillage on private lands; it can only be influenced indirectly by promoting sustainable grazing and voluntary efforts for conservation, such as NRCS SGI program's conservation easements.

Alternative A (No Action)

Under Alternative A, current management would continue on BLM-administered lands in the Miles City planning area. Several protective measures would not be implemented; for example, the BLM would not designate PHMA or GHMA and would not manage any additional ROW avoidance or exclusion areas. 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. Management prescriptions to protect GRSG currently in place include measures such as requiring anti-perching devices on new power lines, and restricting surface disturbance and occupancy within a 0.25-mile radius of the perimeter of occupied or undetermined GRSG leks.

Under current management, energy and infrastructure development has degraded PHMA and GHMA. As a result, GRSG populations in the planning area have declined substantially. The GRSG viability analysis recently conducted for Miles City indicated that the GRSG populations in affected areas of eastern Montana could be at risk of extirpation from the combined effect of energy development, tillage and west Nile virus (Taylor et al. 2010). However, future drilling in the area may have less impact on GRSG due to use of horizontal drilling technology. This may reduce the risk, in conjunction with a planned increase in restoration and continued implementation of the state Core Population Area Strategy.

In the rest of MZ I, other BLM RMP planning efforts would implement their Proposed Plans to improve protection of GRSG and their habitat. In addition GRSG conservation strategies would be implemented on state and private lands. As a result, the lack of protections under the Miles City RMP Alternative A would be offset to an extent by more protective management elsewhere in MZ I. In the planning area, though, continuation of current management would do little to reduce the threats from energy development, mining, and infrastructure on GRSG wintering and breeding grounds. Current management provides a limited number and extent of regulatory mechanisms to avoid continued degradation of GRSG habitat in MZ I, but it would not meet the COT Report objectives for conservation of GRSG.

Alternative B

Alternative B emphasizes protecting natural resources and is the most restrictive alternative for development in GRSG habitat on BLM-administered land in the Miles City planning area. In conjunction with NRCS and state initiatives on private land, several aspects of BLM management under Alternative B would benefit GRSG conservation at a landscape level. These include increasing lek buffers, imposing winter timing limitations and winter habitat restrictions, and protection of brood-rearing habitat. Benefits would be similar elsewhere in the MZ because of implementation of BLM and Forest Service proposed plans (in addition to other conservation efforts) in those areas.

Alternative B is also the most restrictive in terms of motorized vehicle use and mineral development; for example, development of leased fluid minerals would be restricted within 4.0 miles of leks. It also includes a 3 percent disturbance cap. Alternative B and the other action alternatives designate PHMA, GHMA and restoration habitat for GRSG. Alternative B would create the most special designations for resource protection, including for GRSG. Land disposals and acquisitions would focus on maintaining sagebrush acreage and connectivity. GRSG habitat objectives would be considered in grazing management in PHMA, and fires would be suppressed in sagebrush areas. Alternative B would site transmission lines in a location that minimizes impacts on GRSG, managing PHMA as ROW exclusion areas. Similar protections elsewhere in the MZ would result in similar net conservation gains for GRSG habitats and populations in those areas.

Implementing these protective measures on BLM-administered lands within the Miles City planning area would help preserve GRSG habitat in MZ I, but risks pushing development onto adjacent lands with less restrictive management. GRSG in MZ I would benefit most in states where nonfederal lands have similarly restrictive measures such as in Core areas in Wyoming and Montana (though Core areas do not cover all existing GRSG populations). North and South Dakota do not have similar orders protecting GRSG on nonfederal lands; thus, controls on BLM-administered land may not reduce overall impacts on GRSG.

As described above, Alternative B would meet the objectives laid out in the COT Report for fire, invasive plants, range management, recreation, and infrastructure. It would address, though may not meet, the COT objectives for energy and mining, because due to high levels of energy extraction and mining disturbance, stable or increasing populations of GRSG are not expected in MZ I or the Miles City planning area.

Alternative B would minimize agricultural conversion by retaining lands providing GRSG habitat. It may result in more indirect impacts from potential conversions of private land providing GRSG habitat. However, this loss may be limited by the NRCS SGI program, which is helping landowners obtain conservation easements for ranchland providing GRSG habitat.

Alternative C

Alternative C emphasizes resource development and intensive management practices but with limited restrictions for conservation or GRSG protection in the Miles City planning area. It would apply a disturbance cap of 10 percent of surface area, which would degrade GRSG habitat. Alternative C is less restrictive for motorized vehicle use and energy development and applies less stringent restrictions on surface-disturbing activities to protect wildlife. In the Cedar Creek area, energy development would continue to degrade GRSG habitat to the point of making it non-functional for supporting GRSG.

Alternative C's management approach for GRSG has more protections than current management in the Miles City planning area (Alternative A). COT objectives for energy development, infrastructure, mining, range management, fire and invasive plants would likely be met in other areas of MZ I due to implementation of other planning areas' Proposed Plans and other conservation efforts on state and private lands. However, within the Miles City planning area the limited protective measures would not meet the COT objectives. This could put GRSG populations in the Yellowstone Watershed and Powder River Basin at risk of continued decline. GRSG populations in areas where other BLM and Forest Service proposed plans are implemented in addition to other past, present, and reasonably foreseeable future actions to conserve GRSG would likely experience a greater net conservation gain.

Alternative D

Alternative D's impact at the broader MZ level is similar to Alternative C, emphasizing resource development and intensive management practices with limited restrictions for conservation or GRSG protection. It is the least restrictive alternative, along with Alternative C, for motorized vehicle use and energy development. Alternative D applies less stringent restrictions on surface-disturbing activities to protect wildlife. The Miles City RFD (Minerals Appendix) describes the differences in energy development designations between Alternatives C and D. Lease terms under Alternative D provide little meaningful protection to GRSG and in some areas, such as Cedar Creek, continued decline is likely.

Impacts in the remainder of MZ I would be the same as those described under the other alternatives and would help to offset losses in the Miles City planning area. Across the MZ, COT report objectives for range management, fire, and invasive plants would likely be met, but those for energy development, infrastructure, and mining would not be met in the Miles City planning area, a relatively large portion of the MZ.

Alternative E (Proposed)

The Proposed Plan emphasizes sustainable development with moderate constraints on resource uses to protect GRSG and other natural resources. GRSG in SFA would receive the most protection, with NSO stipulations and other protective measures implemented. PHMAs outside SFAs would also be protected by ROW avoidance and NSO, CSU and other protective stipulations. This would protect important habitat with the greatest densities of GRSG over the 20-year analysis period.

Under the Miles City Proposed Plan and other BLM and Forest Service proposed plans in MZ I, the BLM and Forest Service would improve GRSG habitat protection over current management. The Miles City Proposed Plan would increase protective buffers around leks to 2 miles and increase constraints on resource uses in GRSG priority habitat. It would impose a three percent disturbance cap and use adaptive management, monitoring and mitigation to improve the effectiveness of GRSG protection over time. Continued decline of GRSG in Cedar Creek is still possible, but disturbance to birds and habitat would be minimized to the extent possible.

These provisions would protect GRSG more than current management and would complement protections on other lands. The various BLM and Forest Service proposed plans, including in Miles City's, in MZ I would maintain flexibility for land managers in areas with mixed public and private ownership. In such a case, strict restrictions on development on federal lands could result in more widespread development on private lands, without reducing overall impacts on sagebrush habitat.

All BLM and Forest Service Proposed Plans would minimize agricultural conversion, to the extent that this is within agency authority, by retaining lands providing GRSG habitat and by working in conjunction with NRCS efforts to retain private ranchland providing GRSG habitat. However, converting private lands to agriculture would remain a risk to GRSG in MZ I under all alternatives.

In conjunction with state and regional planning efforts, implementation of disturbance caps, conservation easements on private lands, and implementation of the other BLM and Forest Service proposed plans in MZ I, and other past, present and reasonably foreseeable future actions, the Miles City Proposed Plan would best meet the objectives laid out in the COT Report for fire, invasive plants, range management, recreation, and infrastructure. The Miles City Proposed Plan, when added to the other reasonably foreseeable future actions in MZ I, would address, though may not meet, the COT objectives for energy and mining. Because the population in the planning area is not stable or increasing due to prior disturbances, it will be difficult for new management policies to offset these existing impacts over the 20-year analysis period. Other populations, such as the Northern Montana population, are more stable and implementation of the actions described above would not impinge them; thus cumulative effects from energy and mining across MZ I would vary by GRSG population.

Specifically, the following measures which would be implemented under the Proposed Plan, 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 development. These actions would also help to meet the COT objectives for invasive plant species by reducing disturbances that promote the spread of weeds.
- Designating oil and gas stipulations would limit development in PHMA, 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 percent disturbance limit (under the Wyoming and Montana GRSG plans) would reduce impacts contributing to population declines and range erosion associated with threats including energy, mining, and infrastructure.
- Removal of encroaching trees near occupied leks and important habitats (e.g., nesting, wintering, and brood-rearing) 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 livestock grazing, and invasive plant species.

Summary

Overall, GRSG populations across MZ I face pressures from energy development, conversion to agriculture, and such stressors as disease, drought, and fire. These threats are magnified under the stress of habitat fragmentation and the isolation of small populations in the Dakotas, on the eastern edge of the species' range.

GRSG populations respond to a variety of stressors acting in concert. If BLM effectively restricted energy development infrastructure, but adjacent lands were disturbed through tillage, poor grazing practices, or other surface-disturbing activities, the effectiveness of BLM actions would be limited and decreases in GRSG populations in the planning area would be expected. Private lands being converted to tillage is a particularly worrisome threat in this region, because of the economic incentive of high crop prices and the patchwork pattern of landownership between federal and private lands. Because widespread habitat fragmentation and degradation have already occurred in MZ I, GRSG 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 for the Yellowstone Watershed and Powder River Basin populations. Either Alternative B or E (the Proposed Plan) would best promote these goals in the Miles City planning area. These alternatives would be most likely to stabilize GRSG populations throughout MZ I.

Reasonably foreseeable management efforts for control of energy development, mining, infrastructure, grazing, conversion to agriculture, fire, spread of weeds, and recreation are projected to increase through increased coordination of federal, state, and local actions and the implementation of other BLM and Forest Service LUPAs in MZ I. When the impacts of the Miles City RMP are added to these actions, this would result in a net conservation gain to GRSG habitats and populations in MZ I.

Though small fringe populations may continue to decline across MZ I in the next 20 years, implementing Alternative B or the Proposed Plan, in combination with the Proposed Plans for other field offices, development restrictions in the Wyoming and Montana state plans, increased land protections via the NRSC SGI, local and regional habitat restoration efforts, in conjunction with other past, present and reasonably foreseeable future actions, would conserve the region-wide population of GRSG in MZ I.

MZ-WIDE REASONABLY FORESEEABLE FUTURE ACTIONS SUMMARY TABLE

Table K includes a selection of some of the larger projects from the reasonably foreseeable future actions tables in the RMPAs/LUPAs for MZ I. The full tables can be found in each EIS within the MZ.

TABLE K.
REASONABLY FORESEEABLE FUTURE ACTIONS IN MANAGEMENT ZONE I LIKELY TO IMPACT GRSG HABITAT

MZ	Planning Area	GRSG Population (s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
Energy and Mining						
1	Buffalo	Powder River Basin, Wyoming Basin	Greater Crossbow Oil and Gas Exploration and Developmen t Project	Campbell and Converse Counties, Wyoming	Proposed development of1,500 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 percent of the mineral estate is managed by the BLM.[1]	Proposed
I	Wyoming Greater Sage-Grouse	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 GRSG Core Areas.[2]	Proposed
1	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	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
1	Buffalo	Powder River Basin	Powder River Basin Coal Mines	Campbell County, Wyoming	13 operating mines in 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

TABLE K.
REASONABLY FORESEEABLE FUTURE ACTIONS IN MANAGEMENT ZONE I LIKELY TO IMPACT GRSG HABITAT

MZ	Planning Area	GRSG Population (s) Affected	Project Name	Project Location	Project Description, Estimated Footprint	Project Status
I	Miles City	Yellowstone	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[5]	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
1	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
Rights-of-Way						
1	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
1	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 DEIS. 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 DEIS. 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 DEIS. 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 DEIS. 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

WILDLAND FIRE MANAGEMENT AND ECOLOGY

PRESCRIBED FIRE AND FUELS MANAGEMENT

ASSUMPTIONS AND METHODOLOGY

Prescribed fire (caused by management and natural ignitions) areas would typically range from 10 to 10,000 acres in size. Fire management, including prescribed fire, would treat 17,500 acres in the short-term and 70,000 in the long-term.

IMPACTS COMMON TO ALL ALTERNATIVES

Prescribed fire and vegetation manipulations that reduced accumulated hazardous fuels and provided a functioning and sustainable range of variation for key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern would benefit successful fuels management. Future treatments of forest and rangelands would improve health, species composition, and stand densities.

In a large part of the Cedar Creek Restoration Area, habitat and the associated wildlife populations have already been lost. Maintaining habitat would essentially manage past and future disturbances to restore disturbed areas to a point in which the habitats could support greater sage-grouse if and when development ends. The Cedar Creek Anticline is heavily linked to the North Dakota population. As a direct result of oil and gas development in both North Dakota and the Cedar Creek Anticline, greater sage-grouse populations would be expected to decline further. Extirpation of these greater sage-grouse would also be possible.

Prohibiting or limiting surface-disturbing activities within the planning area under *Impacts Common to all Alternatives* would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern.

Allowing vegetation and forestry product management activities would contribute to a successful fuels management program by enabling the improvement and maintenance of ecosystem functionality.

ALTERNATIVE A (No Action)

Summary Statement

Management actions under Alternative A would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern. As fires continued to be suppressed,

vegetation and hazardous fuels would continue to increase. Although buildup of fuels would contribute to the creation of large, high-intensity fires, future treatments of forests and rangelands would improve health, species composition, and stand density. However, because these areas are small in relation to the remainder of vegetation in the planning area, impacts would be confined to a small area.

Resources and Resource Uses

Prohibiting or limiting surface-disturbing activities within the planning area under Alternative A would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern.

Allowing vegetation and forestry product management activities would contribute to a successful fuels management program by enabling the improvement and maintenance of ecosystem functionality.

ALTERNATIVE B

Summary Statement

Management actions under Alternative B would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern. As fires continue to be suppressed, vegetation and hazardous fuels would continue to increase within this alternative. Due to the limitation on the implementation of fuels treatments on approximately 80% of the BLM-administered lands, the buildup of fuels would contribute to unplanned fire starts developing into large, high-intensity wild fires. The areas where future treatments of forests and rangelands are allowed would improve in health, species composition, and stand density. However, because these areas where forestry or rangeland treatments are allowed are small in relation to the total surface in the planning area, impacts would be confined to a small area.

Resources and Resource Uses

Prohibiting or limiting surface-disturbing activities (including no prescribed fire on 2.2 million acres in the planning area) would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern. Allowing vegetation and forestry product management activities on the small remaining lands would enable the improvement and maintenance of ecosystem functionality.

The management of the Wrangler and Rough Lands with Wilderness Characteristics areas lead to an increased possibility of large scale, high severity, crown fires on eastern and northern slopes and drainages in these areas due to the limitations of implementing fuels reductions treatments. The areas would continue to be in fire regime condition classes 2 & 3, indicating moderate and high departure from the natural fire regime of low intensity, surface faces (Fire Regime 1). It is expected that due to the continued increase in tree stand density more of the areas would transition to a high departure from the natural fire regime.

ALTERNATIVE C

Summary Statement

Management actions under Alternative C would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern. As fires continued to be suppressed, vegetation and hazardous fuels would continue to increase. Although buildup of fuels would contribute to the creation of large, high-intensity fires, future treatments of forests and rangelands would improve health, species composition, and stand density. However, because these areas are small in relation to the remainder of vegetation in the planning area, impacts would be confined to a small area.

Resources and Resource Uses

Mitigation measures required for project planning and implementation under this alternative would reduce fuels management activities effective in reducing hazardous fuels or improving wildlife habitat and cause resource competition and stress vegetation across the landscape.

Prohibiting or limiting surface-disturbing activities within the planning area under this alternative would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern.

Allowing vegetation and forestry product management activities would enable the improvement and maintenance of ecosystem functionality.

ALTERNATIVE D

Summary Statement

Management actions under Alternative D would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern. As fires continued to be suppressed, vegetation and hazardous fuels would continue to increase. Although buildup of fuels would contribute to the creation of large, high-intensity fires, future treatments of forests and rangelands would improve health, species composition, and stand density. However, because these areas are small in relation to the remainder of vegetation in the planning area, impacts would be confined to a small area.

Resources and Resource Uses

Mitigation measures required for project planning and implementation would reduce fuels management effective in reducing hazardous fuels or improving wildlife habitat and cause competition for resources and stress vegetation across the landscape.

Prohibiting or limiting surface-disturbing activities within the planning area would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern.

Allowing vegetation and forestry product management activities would enable the improvement and maintenance of ecosystem functionality.

ALTERNATIVE E (Proposed)

Summary Statement

Management actions under Alternative E would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern. As fires continued to be suppressed, vegetation and hazardous fuels would continue to increase. Although buildup of fuels would contribute to the creation of large, high-intensity fires, future treatments of forests and rangelands would improve health, species composition, and stand density. However, because these areas are small in relation to the remainder of vegetation in the planning area, impacts would be confined to a small area.

Resources and Resource Uses

Mitigation measures required for project planning and implementation under this alternative would reduce fuels management activities effective in reducing hazardous fuels or improving wildlife habitat and cause competition for resources and stress vegetation across the landscape.

Prohibiting or limiting surface-disturbing activities within the planning area under this alternative would result in changes to key ecosystem components such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; and fire frequency, severity, and pattern.

Allowing vegetation and forestry product management activities would enable the improvement and maintenance of ecosystem functionality.

CUMULATIVE IMPACTS

Historically (pre-European settlement), many forest stands were open, park-like stands of ponderosa pine and juniper (generally less than 40 percent canopy cover) intermixed with hardwood draws. Mature stands were dominated by large ponderosa pine with an understory of native bunchgrasses and low shrubs. Rangelands were a mosaic of grasses, forbs, and a variety of sagebrush. Prior to European settlement, fires ignited by lightning and American Indians burned frequently throughout the planning area. These frequent, low-intensity fires thinned stands and eliminated the majority of tree regeneration (fire interval 15 to 20 years) and maintained forested stands. (Remnant stands of large, mature ponderosa pine continue to occur in open rocky areas and in the bottom of draws.) Infrequent, mixed-severity fires that created mosaic patterns of varying age classes and species of sagebrush maintained rangelands. Impacts of past actions, natural events, and region-wide decisions (e.g., fire, logging, insect and disease, or road construction) that affected forests and rangelands are described in Chapter 3, *Affected Environment*.

Naturally occurring wildfire existed on the landscape and kept vegetated ecosystems in a continual cycle of disturbance and growth. Under decades of fire suppression, these ecosystems have changed: species diversity is declining, native vegetation is disappearing, the density of encroaching tree species (such as juniper) is increasing, and fire regimes have departed from their typical ranges. Treatments condition class (2 and 3 areas would improve forest health, species composition, and stand densities and decrease numbers of insect and disease-affected trees. Treatments that would restore condition class 1 areas would increase resiliency of forests and, over time, allow fire to play a more natural role.

As wildfires continued to be suppressed, vegetation and hazardous fuels would continue to increase. Buildup of fuels would contribute to the creation of large, high-intensity fires but future treatments of forest and rangelands would improve health, species composition, and stand density. However, because these areas are small in relation to the remainder of vegetation in the planning area, impacts would be confined to a small area.

Alternative A (No Action)

Alternative A would contribute to the anticipated impacts of vegetation departure from historic reference conditions, which would cause declines in species diversity, reductions in native vegetation, and increases in tree density.

Alternative B

Alternative B would contribute to the anticipated impacts of vegetation departure from historic reference conditions, which would cause declines in species diversity, reductions in native vegetation, and increases in tree density.

Alternative C

Alternative C would contribute to the anticipated impacts of vegetation departure from historic reference conditions, which would cause declines in species diversity, reductions in native vegetation, and increases in tree density.

Alternative D

Alternative D would contribute to the anticipated impacts of vegetation departure from historic reference conditions, which would cause declines in species diversity, reductions in native vegetation, and increases in tree density.

Alternative E (Proposed)

Alternative E would contribute to the anticipated impacts of vegetation removal from natural ranges, which would cause declines in species diversity, reductions in native vegetation, and increases in tree density.

WILDFIRE MANAGEMENT

ASSUMPTIONS AND METHODOLOGY

The methodology to determine annual fire occurrence is derived from the Wildfire Management Information (WFMI) program. Data derived from this program indicated that over a period of 21 seasons (1991-2011) 465 fires occurred on BLM–administered lands. Wildfire burned a cumulative total of 908,054 acres (432,556 of which were BLM-administered surface acres). Based on these data, there would be an average of 96 fires annually, 22 of which would occur on BLM-administered surfaces. Wildfires occurring in the planning area can range from 0.1 acres to over 100,000 acres, incorporating multi-agency land jurisdictions. Wildfire size and duration is dependent on weather conditions, terrain and topography, and the fuel type and fuel conditions. Wildfires will continue to be caused primarily by natural ignition sources such as lightning, although humans and spontaneous coal seam outcrop fires will continue to be an ignition source to vegetation on the surface. Based on the data obtained and the suppression resources that are currently in place to response, it is assumed that Class B (0.3 to 9.9 acres in size) fires would continue to be the typical size class of fires occurring, however, fires of all size classes would continue to occur during any given fire season. The BLM could expect an average of 6,300 acres of BLM-administered surface burned annually during any typical wildfire season (April 15 to September 15).

Wildfire management actions involving a range of suppression strategies would occur on all wildfires. The BLM would expect to conduct wildfire suppression activity damage repair, emergency stabilization and burned area rehabilitation actions on 1,000 acres in the short-term and 10,000 acres in the long-term.

IMPACTS COMMON TO ALL ALTERNATIVES

Mitigation actions considered under all alternatives would include allowing fires to burn to natural barriers, managing wildfires to meet multiple objectives where pre-identified containment areas were planned, and using existing roads and previous prescribed or wildfire areas for containment areas (where the previous fire would have removed fuels).

Wildfire management that would be considered to avoid surface-disturbing activities under *Impacts Common to all Alternatives* would include allowing fires to burn to natural barriers, allowing wildfire to meet multiple objectives where pre-identified containment areas were planned, and using existing roads and previous prescribed or wildfire areas to serve as containment areas (because fuels would have been removed by the previous fire event). If the proposed actions were deemed unsuitable in these areas or if the soil-disturbing action could not be mitigated, relocation to an area where soil disturbance would be allowed would lead to larger fires, fires that entered areas of high resource value (such as greater sage-grouse habitat) that may not benefit from a wildfire, or fires that damaged or destroyed adjacent private property.

Management actions or policies that allowed vegetation manipulation or treatment (including habitat improvements, livestock grazing, approximation of natural disturbance regimes, thinning, fuel treatments or management, biomass removal, forest health restoration projects, wood sales, invasive species reductions, natural or prescribed fire, and salvage of dead and dying timber) or implemented proactive management for threatened and endangered species habitat would enhance wildfire management. These actions would contribute to reductions of hazardous fuels on the landscape and help reduce risks to the public and

firefighters. Reducing volume of burnable biomass and vegetation on the landscape would help reduce wildfire severity and intensity, fire behavior, the impacts of wildfire on other resources, and the need to conduct emergency stabilization and burned area rehabilitation. Reducing the severity of these impacts would reduce the need to conduct aggressive wildfire suppression tactics and subsequently reduce the need for wildfire suppression activity damage repair activities. Removal of fine flashy fuels through domestic cattle grazing would provide fuel breaks and reduce available fuels, which would create opportunities to contain wildfires. In recreation areas, less fuel would be available for human-caused fires adjacent to the area. Additionally, continued reductions in vegetation and biomass would reduce costs of wildfire suppression activities.

Fire is an important part of the ecosystem and would potentially be used to restore habitats to native components if applied during the appropriate season. Management actions that allowed the use of wildfire (naturally occurring) to achieve desired resource benefit or the frequency of use of prescribed fire would contribute to restoring the historic fire return interval. Similarly, actions to manage and replace nonnative plant communities would allow for the increased use of wildland fire (prescribed and naturally occurring) to achieve desired resource conditions with native plant communities. These management actions would add requirements to manage invasive vegetation species (weeds) on all suppression activity damage repair actions, which would increase short-term project costs through added tasks but reduce costs in the long-term through the successful control of wildfires.

Any management actions that require protective management or stipulations, restricted ROWs or restrictions to tactical fire suppression actions, require extra actions (such as washing equipment prior to leaving invasive-species-infested areas) or mitigation, or implemented designations that would require protective management or stipulations would delay or reduce efficiency on a wildfire response. Time efficiency and prompt response would be critical to reduce acres burned, reduce vegetative habitat losses, and ensure successful wildfire response and engagement. Delayed responses or restrictions to suppression tactics would result in larger fires, increased habitat loss, increased cost to suppress the fire, and increased risk to the firefighter and public.

Management actions that required restrictions and policies for special designation areas, riparian and wetland areas, water resources, and WSAs would reduce impacts from wildfire suppression actions. Actions taken to manage wildfires in these areas would be designed to maintain the qualities that prompted special designation, maintenance of these qualities would reduce the need for wildfire suppression damage repair and rehabilitation activities.

ALTERNATIVE A (No Action)

Management actions that restricted noise and, subsequently, certain types of suppression equipment under this alternative would result in increased fire perimeters, increased fire suppression costs, and a greater need to rehabilitate burned areas.

Management actions that required mitigation during suppression actions would decrease the need for rehabilitation or suppression activity damage repair actions. Management actions that required avoidance of specific areas would increase land rehabilitation needs (for lands affected by wildfire); reduce wildfire suppression activity damage repair needs, and increase emergency stabilization and rehabilitation and burned area rehabilitation needs.

Management actions that allowed the use of ground-based harvest and slash-treating equipment would contribute to wildfire suppression efforts, suppression damage repair activities, fuels reduction and biomass removal, and emergency stabilization and burned area rehabilitation efforts by allowing unrestricted use of heavy equipment for harvest or slash removal.

Allowing surface water impoundments would provide water sources for aerial fire suppression resources and ground resources. Actions that increased the availability of water for wildfire suppression activities would reduce risks and exposure for firefighters and contribute to rapid wildfire suppression. Less aggressive

suppression actions would be required on some areas of the fire perimeter, which would decrease the total wildfire suppression activity damage and repair activities needed.

Actions or policies that allowed vegetation manipulation or treatment (including range improvements, livestock grazing, haying, and vegetation sales) would contribute to the success of wildfire management activities. Any reduction in burnable vegetation would decrease risks and increase the success of wildfire suppression through decreased fire behavior and reduced fuel loadings. Subsequently, forage removal via grazing (which would remove fine, flashy fuels) and range improvements that removed potential fuels would reduce risk, intensity, fire behavior, and fire suppression costs. Allowing haying would provide fuel breaks and an economical and effective method to remove fine flashy fuels from the landscape or along ROWs. Resource damage from wildfire suppression actions would be reduced, which would also reduce the need for wildfire suppression damage repair activities.

Conversely, management actions that restricted vegetation manipulation or treatment (including haying; forest product sales, salvage, and harvest; cottonwood harvest; range improvements; and livestock grazing) or required management of forestlands for the enhancement of other resources would increase the probability of wildfires that exhibited more severe or extreme fire behavior by increasing the volume of available fuels. Increased fuel loadings would increase fire intensity and behavior, wildfire suppression costs, and risks for the wildland firefighter. As fuel loads increased over time, the size and extent of fires under extreme weather conditions would also increase. As forests continued to grow, fuels available to burn and large trees (both live and dead), the risk of large, high intensity wildfires, and the likelihood of increased insect and disease outbreaks would also increase. Increased fire severity would increase fire rehabilitation costs. Suppression efficacy would be decreased under these management actions, (particularly in areas with conifer encroachment adjacent to wildland-urban interfaces), which would increase risks to communities in areas of wildland-urban interfaces. Extreme fire behavior would require more aggressive suppression actions, which would create a greater need for suppression activity damage repair actions. Costs associated with suppression actions would increase.

If commercial or pre-commercial material could not be removed (through timber sale or mechanical treatment), management actions that required the removal or treatment of pre-commercial and commercial material for sites in Condition Class 3 (53,000 acres) prior to prescribed fire activities would indirectly increase the risk of larger and more intense or more severe wildfires. The timber and biomass market would determine the viability of selling or removing the materials through agreement; subsequently, these materials would be retained on the landscape if they could not be sold, such as during a period with a low or non-existent market demand for these materials. Additionally, because this action would require two separate treatments (the initial removal of material and the planned prescribed fire), requiring the material to be pre-commercially treated prior to prescribed fire would increase human presence in the treatment areas, cause a temporal lag between treatments, and increase costs of the entire treatment.

Allowing prescribed fire in Fire Management Categories B and C would reduce fuels available to burn, fire intensities and severity, and the risks and costs of wildfire suppression in these areas.

Management actions that continued to implement a management response consistent with Fire Management Categories A through D to all human-caused and natural fires would result in all wildfires being suppressed in the planning area. Management actions that retained current fire management zones and categories delineated and managed in the *Miles City Field Office Fire Management Plan* (BLM 2004g) would restrict and prohibit any wildfire management strategy other than immediate full suppression of wildfire. Because of fire management categories identified in the BLM 2004 *Miles City Field Office Fire Management Plan,* continuing with current management under both of these management actions would not allow the use of wildfire to meet multiple objectives. Vegetation and fuels would continue to increase, which would increase risks to firefighters and the cost of the fire suppression.

Management actions that allowed commercial camping and casual recreational shooting opportunities would increase risks of human-caused wildfire within those designated use areas. The damage resulting from human-caused fire and actions to suppress the fire would increase as human use of designated commercial

camping and authorized shooting increased. Conversely, management actions that did not allow these activities would reduce risks of human-caused wildfire within those designated areas.

ALTERNATIVE B

Actions or policies that allowed vegetation manipulation or treatment (including haying, biomass sales, livestock grazing, or range improvements) would contribute to the success of wildfire management activities. Any reduction in burnable vegetation and hazardous fuel would decrease risks and overall costs of the wildfire suppression event and increase the success of wildfire suppression through decreased fire behavior, severity, and intensity and reduced fuel loadings. Fire suppression damage would be reduced, which would reduce fire suppression activity damage repair needs. Subsequently, forage removal via grazing (which would remove fine, flashy fuels) and range improvements that removed potential fuels would reduce risks, intensity, fire behavior, and fire suppression costs. Allowing haying would provide fuel breaks and an economical and effective method to remove fine flashy fuels from the landscape or along ROWs. Wildfire suppression damage would be reduced, which would also reduce the need for wildfire suppression activity damage repair.

Conversely, management actions that restricted vegetation manipulation or treatment (including haying; cottonwood harvest; range improvements; prescribed fires or projects; forestland product sales, salvage, or harvest; or livestock grazing) or required management of forestlands for the enhancement of other resources would contribute to a gradual increase of fuels available to burn. Increased fuel loadings would increase fire intensity and behavior, wildfire suppression costs, and risks for the firefighter. As fuel loads increased over time, the size and extent of fires under extreme weather conditions would also increase. As forests continued to grow, fuels available to burn and large trees (both live and dead), the risk of large, high intensity wildfires, and the likelihood of increased insect and disease outbreaks would also increase. Increased fire severity would increase fire rehabilitation costs. Suppression efficacy would be decreased under these management actions, (particularly in areas with conifer encroachment adjacent to wildland-urban interfaces), which would increase risks to communities in areas of wildland-urban interfaces. Fires occurring in these untreated areas (and timbered habitat types) would be larger, more costly fires to suppress and increase risks to the firefighters and public. Naturally occurring wildfire in untreated areas would result in damage to other resources through of suppression actions, which would subsequently increase wildfire suppression activity damage repair needs. Suspending or temporarily restricting livestock grazing would increase fine fuels during the typical fire season of May to September. Actions that deferred grazing to ensure the presence of adequate fuel to carry a prescribed fire would improve the success and likelihood of achieving desired vegetation management objectives during a prescribed fire action. Retaining fine, flashy fuels would increase risks to the public and the firefighter in the event wildfires would need to be controlled in these areas.

Allowing harvesting of native seed would add to the success of wildfire suppression activity damage repair actions by providing native sources of seeds for wildfire rehabilitation, maintaining the native ecology of the site and increasing the success of the rehabilitation effort.

Requiring habitat compensation under this alternative would increase landscape rehabilitation costs (through burned area rehabilitation or emergency stabilization actions or wildfire management). During a wildfire event, the caps would be exceeded during the most extreme fire weather days because these conditions would be conducive to extreme fire behavior and carry the most risk for suppression activities. Increased suppression efforts and resources would be required during attempts to meet these caps, which would increase costs and surface disturbances over both the short and long-term.

If commercial or pre-commercial material could not be removed (through timber sale or mechanical treatment), management actions that required the removal or treatment of pre-commercial and commercial material for sites in Condition Class 3 (53,000 acres) prior to prescribed fire activities would indirectly increase the risk of larger and more intense or more severe wildfires. The timber and biomass market would determine the viability of selling or removing the materials through agreement; subsequently, these materials would be retained on the landscape if they could not be sold, such as during a period with a low or non-existent market demand for these materials. Additionally, because this action would require two separate treatments (the initial removal of material and the planned prescribed fire), requiring the material to be pre-

commercially treated prior to prescribed fire would increase human presence in the treatment areas, cause a temporal lag between treatments, and increase costs of the entire treatment.

Wildland Fire Management actions under this alternative would result in more effective wildfire suppression strategies and tactics designed to meet resource management goals and objectives through the use of naturally occurring fire on the landscape. Allowing the use of wildfire to meet multiple resource objectives would reduce the costs of fire suppression in some cases and result in an increased number of acres of treated vegetation and an increased number of acres converted back to their natural, historical fire regimes, which would result in a Condition Class of 1 or 2.

Requiring wildfire management implementation plans (natural ignitions to meet multiple objectives) for areas identified to benefit from fire would provide clear resource management goals and objectives.

Management actions that required the use of minimal impact suppression tactics (MIST) would restrict aggressive suppression tactics in these areas, result in larger fire perimeters, and increase the possibility of increased suppression costs. However, because these tactics restrict mechanized equipment and its subsequent impacts on the landscape, the use of MIST would decrease the need for wildfire suppression activity damage repair.

Because specialized equipment would be required to blend the disturbance with the natural surroundings, management actions that required a special design for VRM would result in greater fire suppression activity damage repair and rehabilitation costs.

Removing Howrey Island from ACEC designation would decrease restrictions on wildland fire management activities and result in greater opportunities to manage wildfires in this area with reduced costs and burned areas.

Management actions that allowed commercial camping and casual recreational shooting opportunities would increase opportunities for human-caused wildfire within those designated use areas. The resource damage resulting from human-caused wildfire and actions to suppress the wildfire would increase as use of designated commercial camping and authorized shooting increased. Conversely, management actions that did not allow these activities would reduce risks of human-caused wildfire within those designated areas.

ALTERNATIVE C

Actions or policies that allowed vegetation manipulation or treatment (including haying or seed harvesting; biomass treatment, manipulation, or sales; livestock grazing; range improvements; or prescribed fire) and required management of forestlands for a diversity of forest product production, sustainable yields, and enhancement of resources would contribute to the success of wildland fire management activities. Any reduction in burnable vegetation would decrease risks and increase the success of wildfire suppression through decreased fire behavior and reduced fuel loadings. Wildfire suppression damage would be reduced, which would reduce wildfire suppression activity damage repair activities needed to mitigate impacts to other resources. Reducing biomass and tons per acre of hazardous fuels on the ground or treating fuels according to their capacity to burn would provide opportunities for successful suppression actions and reduce risks to firefighters. Treated areas would experience less severe and intense wildfires, which would reduce the need for wildfire suppression activity damage repair and burned area rehabilitation actions. Wildfire suppression, management, and mitigation costs would be reduced in these healthier environments. In some areas, human-caused wildfire would increase during the drier months (spring and fall), when wood-product gathering would typically occur. Allowing harvest of dead cottonwoods would reduce instances of fire in standing dead cottonwood trees would be reduced in managed cottonwood stands, which would reduce the risk and complexity of any suppression effort through the management of the stability and soundness of the stand. Forage removal via grazing (which would remove fine, flashy fuels) and range improvements that removed potential fuels would reduce fire risks, intensity, fire behavior, and wildfire suppression costs. Livestock grazing would provide opportunities to increase fuel breaks and reduce fuel loadings.

The cumulative reduction of hazardous fuels located in timbered habitat types would reduce the risk of high-severity wildfires in these areas. Managing forested habitats through timber and biomass removal and regular return intervals of prescribed fire (to maintain the resiliency of the stand) would result in a landscape where naturally occurring wildfires would be controlled more easily, at reduced costs, and with reduced risks to the firefighter and the public. Forestland management under this alternative would indirectly result in a safer and more manageable fire environment. Forest fuel and biomass removal would result in less intense and less severe fires. Wildfire suppression, management, and mitigation costs would be reduced in these healthier environments.

Allowing haying would provide fuel breaks and an economical and effective method to remove fine flashy fuels from the landscape or along ROWs. Wildfire suppression damage would be reduced, which would also reduce the need for wildfire suppression activity damage repair.

Management actions that restricted vegetation manipulation or treatment (including livestock grazing and hay and seed harvesting) would increase fine fuels or vegetation available to burn at greater intensities, with greater severity and with increased fire behavior, all of which would increase the risk and cost of the wildfire suppression activities. Increased fuel loadings would also increase risks for the firefighter and communities in areas of wildland-urban interfaces. As fuel loads increased over time, the size of fires under extreme weather conditions would increase. Under this alternative, additional wildfire suppression activity damage repair would be needed to mitigate impacts to other resources. Suppression actions used for naturally occurring wildfire on these acres would cause damage to other resources, which would result in more wildfire suppression activity damage repair activities. Fire behavior characteristics in harvested hay grounds would not be reduced.

Requiring disturbed areas to be fully reclaimed to pre-disturbance conditions or to a desired plant community would increase the costs of wildfire suppression activity damage repair and burned area rehabilitation activities.

Requiring habitat compensation under this alternative would increase landscape rehabilitation costs (burned area rehabilitation activities, emergency stabilization activities, or wildland fire management). During a wildfire event, the caps would be exceeded during the most extreme fire weather days because these conditions would include extreme fire behavior and carry the most risk for suppression activities. Increased suppression efforts and resources would be required during attempts to meet these caps, which would increase costs and surface disturbances over the short and long-term.

Evaluating areas in Condition Class 3 (53,000 acres) on a site-specific basis to determine if mechanical treatments or pre-commercial or commercial thinning were necessary to remove merchantable forest products or reduce heavy fuel loadings prior to prescribed fire activity would ensure attainment of wildfire management goals to sustain the ecological health and function of fire-adapted ecosystems. Overstocked and insect-affected forests and woodlands would provide opportunities to treat areas of timber and biomass with prescribed fire as conditions and funding would allow, which would reduce biomass and hazardous fuels. Less severe and less intense wildfires would occur in areas treated with prescribed fires and the need for wildfire suppression activity damage repair and burned area rehabilitation activities would decrease.

Wildland Fire Management actions under this alternative would result in more effective wildfire suppression strategies and tactics designed to meet resource management goals and objectives. These actions would include management of wildfires to reduce landscape damage and suppression actions, which would reduce damage to resources and require fewer wildfire and burned area rehabilitation activities. Wildfires of reduced severity and intensity would result in areas treated with naturally occurring wildfire, which would result in a reduced need for fire suppression activity damage repair and burned area rehabilitation activities.

Less severe and less intense wildfires would occur in areas treated with prescribed fires and the need for wildfire suppression activity damage repair, and emergency stabilization and burned area rehabilitation would decrease. Evaluating areas in Condition Class 3 (53,000 acres) on a site-specific basis to determine if mechanical treatments or pre-commercial or commercial thinning were necessary to remove merchantable forest products or reduce heavy fuel loadings prior to prescribed fire activity would ensure that wildland fire

management goals to sustain the ecological health and function of fire-adapted ecosystems would be achieved. Overstocked and insect-affected forests and woodlands would provide opportunities to treat areas of timber and biomass with prescribed fire as conditions and funding allowed, which would reduce biomass and hazardous fuels.

Management actions that required the use of MIST would restrict aggressive suppression tactics in these areas, result in larger fire perimeters, and increase the possibility of greater suppression costs. However, because MIST would restrict mechanized equipment and its subsequent impacts on the landscape, the use of these tactics would decrease the need for wildfire suppression activity damage repair actions.

Actions that deferred grazing to ensure the presence of adequate fuel to carry a prescribed fire would improve the success and likelihood of achieving desired vegetation management objectives during a prescribed fire action. If the fire occurred during the most severe or extreme environmental conditions (high temperatures and low humidity) in a typical fire season, impacts from a naturally occurring wildfire would likely be undesirable. Retaining fine, flashy fuels would increase risks to the public and the firefighter in the event wildfires would need to be controlled in these areas.

Management actions that allowed commercial camping and casual recreational shooting opportunities would increase risks of human-caused wildfire within those designated use areas. The resource damage resulting from human-caused fire and actions to suppress the fire would increase as human use of designated commercial camping and authorized shooting increased. Conversely, management actions that did not allow these activities would reduce risks of human-caused wildfire within those designated areas.

Removing ACEC designations would decrease suppression tactic restrictions to surface-disturbing actions for wildland fire management and wildfire suppression activities.

ALTERNATIVE D

Management actions that required reclamation or mitigation actions following surface disturbances would increase the costs of fire suppression by increasing the need for suppression activity damage repair and emergency stabilization and burned area rehabilitation activities. However, the habitat requirement under Greater Sage-grouse Habitat – General Habitat Areas would allow surface disturbances related to fire suppression activities because these activities would be implemented to maintain greater sage-grouse habitat functionality. Damages caused by the suppression action and the wildfire would be rehabilitated to desired specifications to comply with this management action.

Requiring mitigation under this alternative would increase costs through an increased need to apply wildfire suppression activity damage repair actions to counter wildfire suppression activity damage. Wildfire suppression activity damage repair needs would be reduced while emergency stabilization and rehabilitation and burned area rehabilitation needs would increase.

Actions or policies that allowed vegetation manipulation or treatment (including haying; biomass treatment, manipulation, or sales; livestock grazing; range improvements; or prescribed fire) and required management of forestlands for a diversity of forest product production, sustainable yields, and enhancement of resources would contribute to the success of wildland fire management activities. Any reduction in burnable vegetation would decrease risks and increase the success of wildfire suppression through decreased fire behavior and reduced fuel loadings. Wildfire suppression damage caused by aggressive suppression actions would be reduced, which would decrease the need for wildfire suppression activity damage repair activities. Forage removal via grazing (which would remove fine, flashy fuels) and range improvements that removed potential fuels would reduce risk, intensity, fire behavior, and fire suppression costs.

The cumulative reduction of hazardous fuels located in timbered habitat types would reduce the risk of high-severity wildfires in these areas. Managing forested habitats through timber and biomass removal and regular return intervals of prescribed fire (to maintain the resiliency of the stand) would result in a landscape where naturally occurring wildfires would be controlled more easily, at reduced costs, and with reduced risks to the firefighter and the public. Forestland management under this alternative would indirectly result in a safer and

more manageable fire environment. Forest fuel and biomass removal would result in less intense and less severe fires. Fire suppression, management, and mitigation costs would be reduced in these healthier environments.

Allowing haying would provide fuel breaks and an economical and effective method to remove fine flashy fuels from the landscape or along ROWs. Wildfire suppression damage would be reduced, which would also reduce the need for wildfire suppression activity damage repair.

Management actions that restricted vegetation manipulation or treatment (including livestock grazing, prescribed fire, range improvements, and haying) would increase fine fuels or vegetation available to burn at greater intensities, with greater severity and with increased fire behavior, all of which would increase the risk and cost of the wildfire suppression activities. Increased fuel loadings would also increase risks for the firefighter and communities in areas of wildland-urban interfaces. As fuel loads increased over time, the size of fires under extreme weather conditions would increase, and these fuels would be available to burn at greater intensities, severities, and with increased fire behavior, which would subsequently increase the risks and costs of the wildfire suppression event and the need to conduct wildfire suppression activity damage repair actions in these areas. Extreme fire behavior would limit success of the suppression activity and increase risks to the firefighter and wildlife habitat. Grazing would provide opportunities for fuel breaks on the landscape by reducing fine fuel loadings.

Requiring full reclamation of disturbed areas would result in higher costs of wildfire suppression damage repair and emergency stabilization and burned area rehabilitation activities.

Requiring habitat compensation under this alternative would increase landscape rehabilitation costs through increased burned area rehabilitation, emergency stabilization, or wildland fire management needs. During a wildfire event, the caps would be exceeded during the most extreme fire weather days because these conditions would include extreme fire behavior and carry the most risk for suppression activities. Increased suppression efforts and resources would be required during attempts to meet these caps, which would increase costs and surface disturbances over the short and long-term.

Evaluating areas in Condition Class 3 (53,000 acres) on a site-specific basis to determine if mechanical treatments or pre-commercial or commercial thinning were necessary to remove merchantable forest products or reduce heavy fuel loadings prior to prescribed fire activity would ensure attainment of wildland fire management goals to sustain the ecological health and function of fire-adapted ecosystems. Overstocked and insect-affected forests and woodlands would provide opportunities to treat areas of timber and biomass with prescribed fire as conditions and funding would allow, which would reduce biomass and hazardous fuels. Less severe and less intense wildfires would occur in areas treated with prescribed fires and the need for fire suppression activity damage repair and burned area rehabilitation activities would decrease.

Management actions that allowed commercial camping and casual recreational shooting opportunities would increase risks of human-caused wildfire within those designated use areas. The damage resulting from human-caused fire and actions to suppress the fire would increase as human use of designated commercial camping and authorized shooting increased. Conversely, management actions that did not allow these activities would reduce risks of human-caused wildfire within those designated areas.

ALTERNATIVE E (Proposed)

Management actions that restricted or required avoidance of surface-disturbing and disruptive activities would restrict effective wildland fire management suppression tactics for quickly suppressing wildfires. These actions would prevent suppression actions using heavy equipment and result in larger fire perimeters, increased acres of burned habitats, increased needs for emergency stabilization and burned area rehabilitation actions, and increased suppression times (which would cause increased smoke exposure in local areas) and costs. Although wildfire suppression activity damage repair needs would be reduced, emergency stabilization and rehabilitation and burned area rehabilitation needs would increase under these management actions. Restrictions on slopes and sensitive soils would contribute to heavy accumulations of fuel loadings in these areas, which would create greater fire hazards and contribute to landscape hazards and an unsafe

environment. If heavily loaded slopes burned, erosion and burned area rehabilitation needs would increase. A fire moving upslope poses a greater hazard than a comparable fire on a flat landscape.

Management actions that allowed surface-disturbing or disruptive activities under this alternative would contribute to successful and efficient wildfire suppression tactics to contain wildfires. Although burned area rehabilitation and emergency stabilization actions would be reduced through aggressive suppression actions, wildfire suppression activity damage repair needs would increase with the use of surface-disturbing equipment.

Allowing surface-disturbing and disruptive activities in areas subject to specific habitat requirements would increase the amount of post-wildfire burned area rehabilitation needed and increase fire suppression activity actions necessary to mitigate surface-disturbing actions. Suppression and rehabilitation costs would increase.

Avoiding surface-disturbing activities within 300 feet of waterbodies, wetlands, and streams would decrease the rehabilitation needs from suppression damage but increase the emergency stabilization and burned area rehabilitation actions to mitigate the impacts of vegetation removal caused by wildfire adjacent to the waterbody, wetland, or stream. Actions that allowed water impoundments would contribute to successful fire management.

Actions or policies that allowed vegetation manipulation or treatment (including hay or seed harvesting; biomass treatment, manipulation, or sales; livestock grazing; range improvements; or prescribed fire) and required management of forestlands for a diversity of forest product production, sustainable yields, and enhancement of resources would contribute to the success of wildland fire management activities. Any reduction in burnable vegetation would decrease risks and increase the success of wildfire suppression through decreased fire behavior and reduced fuel loadings. Forage removal via grazing (which would remove fine, flashy fuels) and range improvements that removed potential fuels would reduce risk, intensity, fire behavior, and fire suppression costs. Fire suppression damage would be reduced, which would reduce wildfire suppression activity damage repair activities needed to mitigate impacts to other resources. Reducing biomass and tons per acre of hazardous fuels on the ground or treating fuels according to their capacity to burn would provide opportunities for successful suppression actions and reduce risks to wildland firefighters.

Treated areas would experience less severe and intense wildfires, which would reduce the need for wildfire suppression activity damage repair and burned area rehabilitation actions. Wildfire suppression, management, and mitigation costs would be reduced in these healthier environments. In some areas, human-caused wildfire would increase during the drier months (spring and fall), when wood-product gathering would typically occur. Instances of fire in standing dead cottonwood trees would be reduced in managed cottonwood stands, which would reduce the risk and complexity of any suppression effort through the management of the stability and soundness of the stand.

The cumulative reduction of hazardous fuels located in timbered habitat types would reduce the risk of high-severity wildfires in these areas. Managing forested habitats through timber and biomass removal and regular return intervals of prescribed fire (to maintain the resiliency of the stand) would result in a landscape where naturally occurring wildfires would be controlled more easily, at reduced costs, and with reduced risks to the firefighter and the public. Forestland management under this alternative would indirectly result in a safer and more manageable fire environment. Forest fuel and biomass removal would result in less intense and less severe fires. Wildfire suppression, management, and mitigation costs would be reduced in these healthier environments.

Allowing haying would provide fuel breaks and an economical and effective method to remove fine flashy fuels from the landscape or along ROWs. Wildfire suppression damage would be reduced, which would also reduce the need for wildfire suppression activity damage repair.

Management actions that restricted vegetation manipulation or treatment (including livestock and hay and seed harvest) would increase fine fuels or vegetation available to burn at greater intensities, with greater severity and increased fire behavior, all of which would increase the risk and cost of the wildfire suppression activities (including wildfire suppression damage repair activities). Increased fuel loadings would also

increase risks for the firefighter and communities in areas of wildland-urban interfaces. As fuel loads increased over time, the size of fires under extreme weather conditions would increase. Grazing would provide opportunities for fuel breaks on the landscape by reducing fine fuel loadings. Additional wildfire suppression activity damage repair would be needed to mitigate impacts to other resources. Livestock grazing would provide opportunities to increase fuel breaks and reduce fuel loadings. Suppression actions used for naturally occurring wildfire on these acres would cause damage to other resources, which would result in more wildfire suppression activity damage repair activities. Fire behavior characteristics in harvested hay grounds would not be reduced.

Requiring full reclamation of disturbed areas would result in higher costs of wildfire suppression activity damage repair and burned area rehabilitation activities.

Evaluating areas in Condition Class 3 (53,000 acres) on a site-specific basis to determine if mechanical treatments or pre-commercial or commercial thinning were necessary to remove merchantable forest products or reduce heavy fuel loadings prior to prescribed fire activity would ensure attainment of wildland fire management goals to sustain the ecological health and function of fire-adapted ecosystems. Overstocked and insect-affected forests and woodlands would provide opportunities to treat areas of timber and biomass with prescribed fire as conditions and funding would allow, which would reduce biomass and hazardous fuels. Less severe and less intense wildfires would occur in areas treated with prescribed fires and the need for wildfire suppression activity damage repair and burned area rehabilitation activities would decrease.

Management actions that required the use of MIST would restrict aggressive suppression tactics in these areas, result in larger fire perimeters, and increase the possibility of greater suppression costs. However, because MIST would restrict mechanized equipment (and its subsequent impacts on the landscape), the use of these tactics would decrease the need for wildfire suppression activity damage repair actions.

Actions that deferred grazing to ensure the presence of adequate fuel to carry a prescribed fire would improve the success and likelihood of achieving desired vegetation management objectives during a prescribed fire action. If the fire occurred during the most severe or extreme environmental conditions (high temperatures and low humidity) in a typical fire season, impacts from a naturally occurring wildfire would likely be undesirable. Retaining fine, flashy fuels would increase risks to the public and the firefighter in the event wildfires would need to be controlled in these areas.

Management actions that allowed commercial camping and casual recreational shooting opportunities would increase risks of human-caused wildfire within those designated use areas. The damage resulting from human-caused fire and actions to suppress the fire would increase as human use of designated commercial camping and authorized shooting increased. Conversely, management actions that did not allow these activities would reduce risks of human-caused wildfires within those designated areas.

CUMULATIVE IMPACTS

Wildfire is a natural component of the ecosystem and the geological record contains evidence of wildfire occurrence in the planning area. Until the organized suppression of wildfire started around the turn of the century, naturally occurring wildfire kept vegetated ecosystems in a continual cycle of disturbance and growth. Continued exclusion of naturally occurring wildfires creates gradual and unnatural increases in fuel accumulations, which increases the potential for wildfires of greater size and intensities than would occur under natural fire regimes. Under decades of wildfire exclusion, these ecosystems have changed: species diversity is declining, native vegetation is disappearing, the density of encroaching tree species (such as juniper) is increasing, and fire regimes have departed from their typical ranges.

The continual growth and sprawl of wildland-urban interface, which would continue and increase on private lands bordering public lands, compound the risk for larger and more costly wildfires through the loss of private property. Naturally occurring wildfires in the planning area would continue at the same annual occurrence on average. Human-caused wildfire would likely increase as wildland-urban interfaces increased and public lands became more accessible or available for public use.

As fires continued to be suppressed, vegetation and hazardous fuels would continue to increase. Continued global climate change will continue to modify the history typical fire season. Increased temperatures, increased vegetation growth combined with fuel buildup would contribute to the creation of large, high-intensity fires, which would subsequently increase suppression costs. The risk to firefighters, public and private land and property, cultural and paleontological resources, and other natural resources would increase as the potential for larger fires increased.

High severity fire potentials would continue. The need to implement wildfire suppression activity damage repair, emergency stabilization, and burned area rehabilitation actions on the landscape would increase as this potential for large fires increases, which would subsequently increase the cost of the suppression event and its impacts to the landscape.

The management actions under Alternatives A, B, C, and E would contribute to the anticipated impacts. Actions under C, D, and E would require fewer restrictions to wildfire management actions on the landscape and provide for more options to manage wildfire within the ecosystem and allow for opportunities to suppress fires at less cost.

Alternative A (No Action)

Management actions under Alternative A would increase the costs of wildfire suppression to trend along the 10-year national average.

Alternative B

Management actions under Alternative B would increase the costs of wildfire suppression to trends higher than the 10-year national average.

Alternative C

Although management actions under Alternative C would increase the costs of wildfire suppression to trend along the 10-year national average, they would provide opportunities to reduce costs.

Alternative D

Although management actions under Alternative D would increase the costs of wildfire suppression to trend along the 10-year national average, they would provide opportunities to reduce costs.

Alternative E (Proposed)

Although management actions under Alternative E would increase the costs of wildfire suppression to trend along the 10-year national average, they would provide opportunities to reduce costs.

CULTURAL RESOURCES

Cultural resources are defined as the places where the physical remains of past peoples can be found. If these remains are determined to be important, federal regulations require that effects to the resources be assessed and mitigation measures be instituted to help protect them.

Adverse impacts to cultural resources typically result when there is a loss of information and/or a loss of integrity of the resource. Impacts on significant prehistoric, historic, and spiritual/sacred/traditional cultural resources on BLM-administered lands can include actions that physically damage or destroy all or parts of a resource; actions that alter a significant element of a resource; actions that introduce visual, atmospheric (air), or audible (noise) elements that can diminish the historical integrity of a resource or alter the sensitive surrounding settings of a resource; or a lack of action that causes a resource to deteriorate. Increased access to

areas that contain cultural resources can result in increased use, erosion, looting, and vandalism, all adverse impacts.

Actions that cause physical damage or destruction, or neglect, generally result in adverse impacts to cultural resources significant for their scientific-data potential; prehistoric campsites often fall into this category. Although data recovery at these sites can increase our knowledge of the past, adverse impacts to these types of resources are considered long-term, because once the resources are damaged or disturbed, impacts cannot be reversed.

All the actions identified above can adversely affect cultural resources significant for their important historical associations, their unique architectural, artistic, or representational characteristics, or their important spiritual and/or religious associations. Prehistoric and historic sites such as Battle of the Rosebud NHL (24BH2461), Wolf Mountains Battlefield NHL (24RB0787), Deer Medicine Rocks NHL (24RB0401), Fort Union Trading Post NHL (24RV0050), Cedar Creek Battlefield (24PE0261), Reynolds Battlefield ACEC (24PR0089), Powder River Depot ACEC (24PE0231), Long Medicine Wheel (24MC0148), Hagen site NHL (24DW0002), Lewis and Clark Trail and Tongue River Valley Cultural Landscape are some of the sites in this category. Adverse impacts to these types of resources can be short-term and long-term, because some impacts could be reversed, while others could not.

Finally, all types of actions can adversely affect cultural resources significant for their spiritual, sacred, and/or traditional values. Prehistoric and historic sacred sites such as Battle of the Rosebud NHL (24BH2461), Wolf Mountains Battlefield NHL (24RB0787), Deer Medicine Rocks NHL (24RB0401), Cedar Creek Battlefield (24PE0261), Reynolds Battlefield ACEC (24PR0089), Long Medicine Wheel (24MC0148) and Tongue River Valley Cultural Landscape are some of the sites in this category. Adverse impacts to these types of cultural resources would be mostly long-term, because Native American groups consider such impacts to have a permanent impact on the spiritual nature of the sites.

Beneficial impacts on cultural resources result from special management measures that enhance the quality of a resource or its surroundings. Stabilization and repair of historic structures, stabilization at rock art sites and inscription sites, and fencing at grave sites as at Powder River Depot ACEC (24PE0231) are examples of beneficial impacts. Erosion control measures at some prehistoric and historic campsites are also examples of beneficial types of impacts. Most of these beneficial impacts would be long-term, but eventually, more measures will be required to prevent natural and/or human influences from degrading these resources. Additional beneficial impacts to cultural resources results from the requirement to conduct cultural resource inventory on the numerous management actions proposed, resulting in the location and recoding of additional cultural resource sites, furthering the knowledge of the prehistory and history of the area.

SUMMARY OF IMPACTS

Impacts to cultural resources would vary by alternative. Alternatives A and D are similar in their protections, but Alternative D generally provides more protections than Alternative A. Alternative B provides the greatest protection for cultural resources. Alternative B provides greater protection for cultural resources than alternatives A, C and D, and somewhat more protection than Alternative E. As for specific resources, the Yonkee site (24PR0005), for example, is somewhat protected under Alternative A, well protected under alternatives B and E, and minimally protected under Alternatives C and D. Spiritual/sacred/traditional sites receive similar protections under all alternatives, although management would be more effective under alternatives B and E and less effective under Alternatives C and D.

The number of sites various actions would affect correlates directly with the degree, nature, and quantity of surface-disturbing and other disruptive activities in the planning area. In this regard, Alternatives C and D would result in the most surface disturbance and Alternative B the least.

Under all alternatives, the BLM continues its obligation to conduct government-to-government consultations with interested tribes. Actions required by the NHPA and the Montana State Protocol Agreement will form the foundation of all project-specific decisions regarding cultural resources under all alternatives. Conflicts between cultural resources and other resource uses not covered by this RMP will generally be resolved by the

Montana State Protocol Agreement and NHPA provisions. However, Alternatives A, C and D would require the most consultation with the State Historic Preservation Officer (SHPO) because more surface-disturbing activities would occur under these alternatives.

ASSUMPTIONS AND METHODOLOGY

The degree of adverse impacts to sites and the total number of sites adversely impacted in the planning area is directly correlated to the amount of surface-disturbing or other disruptive activities allowed under each alternative. Cultural resources would be increasingly adversely impacted as the amount of resource use increases. Reduction or elimination of land uses in a particular area would benefit cultural resources through a reduction in direct and indirect impacts to the resources.

All authorizations for land and resource use must comply with all relevant cultural resource laws, regulations, protocols, and policies. Protection of cultural resources must also conform to SHPO coordination requirements, with input from the local public, other interested parties, and Native American groups.

A cultural resource inventory, evaluation of site NRHP eligibility, and assessment of potential impacts from federal actions are required by law before the initiation of most surface-disturbing and other disruptive activities. This generally requires a Class III intensive field inventory of the affected area. This allows for prescriptive mitigation of impacts through avoidance or other measures where necessary, and minimizes or eliminates the potential for unmitigated impacts to cultural resources. In areas with high potential for buried resources, construction monitoring and open trench inspection are some of the methods used to discover and protect cultural resources not apparent from surface inventories.
Cultural resources are evaluated according to their significance under NRHP criteria. If cultural resources are found to be eligible for inclusion on the NRHP, they are managed for preservation of their important values. Conversely, if the resources are found to be not eligible for inclusion on the NRHP, they are, in most cases, not managed or preserved, but in most cases avoidance is still the preferred mitigation choice. Depending on the nature of their value, eligible resources are managed through avoidance and preservation, or if that is not feasible, through data recovery, intensive recordation, or interpretive/education mitigation.

Some significant cultural resources include the historical settings around them. For example, historic trails, sites, battlefields, and sacred sites can contain intact settings, in which the landscape still retains much of the character it had when the historic events occurred. These historical settings are often considered an important component of the cultural resource, and can be included in consideration of potential impacts to the resource.

Certain projects, due to size or topography, could require consideration of visual intrusions into the setting beyond the foreground or middle-ground zones to comply with NHPA Section 106.
For example, historic trails, such as the Lewis and Clark NHT, direct and indirect impacts can result from a variety of natural and human-caused actions, such as those that physically alter, damage, or destroy all or part of the trail; improved access, which brings increased use to an area, altering characteristics of the surrounding environment that contribute to the trail's importance; the introduction of visual or audible elements out of character with the trail or that alter its historic setting; and neglect of the trail to the extent that it deteriorates or is destroyed. Recognizing that historic trails often comprise numerous routes rather than a single trace, all protective zones are measured from the outer edges of the trails rather than from the center line. Under all alternatives, the BLM encourages opportunities to cooperate with private landowners to minimize or eliminate disturbance to historic trails.

Cultural resources would be treated similarly and equally in terms of type, composition, and significance. Cultural resources are treated in this manner only for purposes of evaluation in this document (since the particular cultural resources that would be affected are not necessarily known at this time) but not all cultural resources are equal in terms of importance, National Register of Historic Place (NRHP) eligibility, density, and location. Federally recognized tribes would need to be consulted consistent with the requirements of the National Historic Preservation Act (NHPA) and regulations found at 36 CFR Part 800. Most of the mitigation for American Indian cultural resources would necessitate avoidance, particularly any site associated with burial of human remains. Cultural resource attributes would need to be considered when impacts are considered for each proposed management action. Additionally, when addressing impacts to cultural

resources from various management actions, cultural resource sections of plans would need to include or follow guidelines in BLM's 8100 Manual Series, the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (NPS 1983), and the Advisory Council on Historic Preservation's, *Treatment of Archeological Properties* (ACHP 1980).

Based on information extrapolated from Aaberg, Hanna, Crofutt, Green, and Vischer 2006, for the sake of this analysis, cultural resources would be considered evenly distributed across the landscape. There would be 1 cultural site for every 100 acres of land. This assumption is based on studies conducted in the planning area and was prepared by averaging the number of recorded sites divided by acres surveyed in the planning area. The actual number of cultural resources affected by a management action could vary dramatically depending on their location in the planning area. Approximately 10 to 15 percent of sites found are determined eligible for the NRHP. There would be 1 excavation every 5 years to conduct research, which would disturb 1 to 5 acres. Unless otherwise noted, surface-disturbing activities related to resource use would be evenly distributed across the landscape.

IMPACTS COMMON TO ALL ALTERNATIVES

Cultural resources in the planning area frequently experience adverse impacts. There are many different causes for these impacts, including surface disturbance, overuse, introduction of elements out of character with the resource, neglect, erosion, natural deterioration, and looting and vandalism. Surface disturbance is by far the most common adverse impact to cultural resources, especially in areas of industrial development.

Standard procedures have been developed to help address impacts to significant cultural resources, and include archival research, on-the-ground inventories, site recordation and evaluation, data recovery excavations, condition assessments, stabilization, and, in certain cases, avoidance. These standard procedures can protect cultural resources from damage where cultural resources are known or discovered. All of the alternatives are guided by these standard procedures.

However, standard procedures sometimes do not protect all types of cultural resources. Development projects can indirectly affect resources where setting is important. Projects that intrude on important historical settings can affect connected historic trails or sites. For example, a modern powerline built near the Lewis and Clark NHT could adversely impact the historical setting of the trail and would adversely affect its historical integrity. To help reduce these types of adverse impacts, land users and the BLM are able to and have entered into agreements where special guidelines to reduce visual effects have been incorporated into field-wide operations.

Another issue is that standard procedures do not identify all cultural resources before they experience adverse impacts, which can happen when cultural resources are below ground level and not visible from the surface. These resources are often discovered only after surface-disturbing activities have uncovered them, and construction activities can quickly and severely affect them, with data lost in the process. This type of impact occurs regularly in the planning area because sites thousands of years old are often buried by vegetation and soil. In these cases, mitigation usually entails data recovery and salvage excavations. These excavations are designed to retrieve the remaining data from the site and study it to reconstruct what occurred there in the past.

Consequently, any management action resulting in surface disturbance, including the use of heavy equipment would have the potential to impact significant cultural resources if sites were not avoided. Surface disturbance, including some mitigation, would alter the characteristics of a significant cultural or historic property by diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Other impacts to cultural resources from proposed activities would include the destruction, damage, or alteration to all or part of the cultural resource; diminishment of the property's significant historic features caused by the introduction of visual, atmospheric, or auditory elements; and property loss through transfer, lease, or sale. The BLM recognizes the importance of scientific study to retrieve and interpret important cultural resource information, and significant properties must be preserved intact for this to occur. Actions taken to protect properties by avoiding any disturbance often causes relocation of the activity.

Adherence to the cultural resource laws and regulations, in most instances, would minimize or mitigate these impacts. Prior to the commencement of surface-disturbing activities, cultural resource inventories would be

required. These inventory requirements would result in the identification of cultural resources and avoidance or mitigation of impacts to significant sites prior to surface disturbance.

In most surface-disturbing situations, cultural resources would be avoided (a BMP) by project redesign or relocation, which would eliminate the need for the implementation of mitigation measures. However, should a cultural property be unavoidable, impacts to significant properties would be mitigated prior to implementation of a project.

Surface-disturbing activities would also potentially lead to the discovery of sites that would otherwise remain undiscovered because they were buried or omitted during review of inventories. Although surface-disturbing activities would disturb or destroy buried cultural resource properties, activities at significant sites would be mitigated by excavation to recover data. Cultural resource surveys conducted prior to surface-disturbing activities would potentially locate additional cultural resources and result in a better understanding of the nature and distribution of those resources.

Impacts would also occur to cultural resource properties or areas that derived their significance from topographic settings or feelings or religious values attributed to their setting (e.g., battlefield sites or properties with religious values). In these circumstances, if development were proposed around the edges of these properties, the values, settings, or feelings that make these properties significant would be lost. In some cases, mitigation would not offset impacts from surface-disturbing activities and development; for example, activities at sites with religious values cannot be mitigated through standard mechanical or archival means.

If an activity that cannot be relocated would impact a cultural site available for scientific study, it would be mitigated prior to authorization of the disturbance. If a significant property would be affected by natural means, such as erosion, steps would be taken to reduce these impacts and prevent further degradation. In addition, the property would potentially be subjected to salvage mitigation measures. Making significant cultural sites available for scientific study would increase the cultural resource database and scientific body of knowledge. Recovery or preservation of data from new resources would require that the BLM and scientific community were notified.

Although mitigation by excavation recovers valuable data, the process of archeological excavation, using even the most current archeological methods and technology that employed the best data recovery practices, would cause the destruction of cultural properties and the destruction and loss of some data. Data lost during excavation would not be available for future study when better analytical techniques may be available.

Allocating all cultural properties in the planning area to one of the six Cultural Resource Program planning use categories (scientific use, conservation for future use, traditional use, public use, experimental use, and discharged from management) would assist in the planning and implementation of cultural resource management, which would assist to preserve and protect the range of cultural resource values on BLM-administered lands.

Managing cultural resource values in accordance with Sections 106 and 110 of NHPA and avoiding register-eligible cultural sites through project abandonment, project redesign, or, as a last resort, mitigation of adverse impacts (through data recovery or other alternative means) would assist to preserve and protect the range of cultural resource values located on BLM-administered lands. Avoidance of register-eligible cultural sites through project abandonment or project redesign would be preferred because any data recovery effort would cause residual impacts from the data loss inherent to archeological excavations. However, in some cases, actions requiring avoidance of cultural sites would potentially result in impact to other cultural resources, which would cause rerouting of activities.

BLM consultation with American Indian Tribes to identify cultural values or places of traditional cultural practices and religious beliefs potentially affected by the BLM's proposed actions would assist to preserve and protect cultural values of interest to American Indian Tribes on BLM-administered lands.

When management actions would include surface-disturbing activities (such as overburden removal, heavy earth-moving equipment use, and road or trail construction), cultural resources would potentially still be affected by the excavation and removal of cultural sites.

Any management action proposing surface disturbance, including the use of heavy equipment, would have the potential to impact significant cultural resources. Surface disturbance, including some mitigation, would alter the characteristics of a significant cultural or historic property by diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Other impacts to cultural resources from proposed activities would include the destruction, damage, or alteration to all or part of the cultural resource; diminishment of the property's significant historic features as a result of the introduction of visual, atmospheric, or auditory elements; and loss of the property through transfer, lease, or sale.

Full suppression of wildfire and limitations on the use of prescribed fire provide short-term benefit to cultural resources (assuming that firefighting efforts themselves do not damage cultural resources). On a long-term basis, cultural resources could be adversely impacted if the techniques utilized do not prevent landscape-level fires.

Vehicle and equipment servicing and refueling activities would impact cultural resources. However, prior to authorizing and permitting these areas, the BLM would require a cultural resource inventory to determine the presence of cultural resources; if cultural resources were present, the vehicle and equipment servicing and refueling areas would be relocated to an area in which they would not impact cultural resources.

Although fire would impact cultural resource materials, in some cases, fire would not diminish characteristics affecting a site's eligibility for the NRHP. For example, although high heat may destroy obsidian hydration bands on surface artifacts, the surface component of the site may not be of particular value in the site's overall assessment; although fire may burn the solder out of a hole-in-cap can, this impact would not diminish chronological information obtained from the can (Winthrop 2004).

Prescribed fire would have the potential to impact cultural resources through fireline disturbances associated with fire containment. Cultural resource surveys would be conducted to identify cultural values prior to the prescribed fire action and avoidance would be the standard field operating procedure employed.

Wildfire would generally be more destructive to cultural resources than prescribed fire because it would include impacts from uncontrolled fire and fire suppression.

In some extreme cases, fire suppression efforts critical to protect human life or property would damage or destroy cultural or historic sites. However, impacts to known cultural resources would be considered and mitigated under standard protocols.

Fire rehabilitation efforts would generally increase the protection of cultural deposits unaffected by wildfire or prescribed fire by preventing or reducing erosion and encouraging rapid re-vegetation of denuded surfaces. Potential impacts from rehabilitation activities (such as mechanical reseeding) would be mitigated under standard procedures.

Livestock grazing would have the potential, although remote, to impact cultural resources through trampling, trailing, and rubbing. Impacts to surface sites and artifacts would include disturbance of site context, disturbance to the integrity of material association, and damage to artifacts. Cattle trailing, particularly to and from water sources and along fencelines, would create ruts that would expose sites and artifacts, which would result in accelerated erosion that would cause damage to, and loss of, sites, information, and remains. Increased erosion caused by vegetation removal by livestock would result in additional impacts to prehistoric sites and features. Buried prehistoric sites located along major streambanks would be subject to livestock-caused streambank erosion. Livestock that gathered under or near structures for shade or shelter or livestock that rubbed or leaned on the structures would impact historic sites, such as those with fragile standing buildings and structures related to homesteading, by causing wear or possible collapse of the structure.

Many surface sites are not considered significant because they lack depositional component and a pre-existing lack of integrity of material association caused by lengthy surface exposure to natural wind and sheet erosion, which disturbs their associative integrity.

The standard procedures mentioned above also do not apply to small locatable minerals exploration. Locatable minerals projects affecting fewer than 5 acres are subject to the 43 CFR 3809 "Notice of Intent" regulations, which offer minimal protections to cultural resources. These operations do not require BLM approval and can result in adverse impacts to cultural sites if necessary for mining operations to proceed. However, these operations are still subject to the Archeological Resources Protection Act and other statutes that protect cultural resources. Locatable minerals projects affecting more than 5 acres are subject to the 43 CFR 3809 "Plan of Operations" regulations.

Impacts to cultural resources from oil and gas development within the MLP area would be the same as those described for oil and gas development outside of the MLP area.

A lease notice, which is a notice that provides additional information to oil and gas lessees that does not place restrictions on lease operations, but provides information about applicable laws and regulations and the requirements for additional information to be supplied by lessees, is added to all oil and gas leases notifying the lessees that in the absence of extensive cultural resource inventories leases may contain historic properties or resources protected under the National Historic Preservation Act, the American Indian Religious Freedom Act (42 U.S.C. 1996), Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq.), Executive Order 13007 (May 24, 1996), or other statutes and executive orders and as a consequence, the BLM may not approve ground-disturbing activities that may affect cultural properties or resources until it completes its obligations (e.g., state historic preservation officer and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated.

Increased public use of lands can also result in adverse impacts. Increased public use occurs due to improved access to formerly remote areas, such as areas where development creates new roads, or the use of OHVs to access formerly remote areas. A third cause is increased public interest in specific historic sites or areas. As public use increases from all these causes, so do impacts to cultural resources. As more use occurs, more cultural resources are visited or driven over, and some of the resources are looted or vandalized. This adverse impact would occur under any of the alternatives because access, OHV use, and public use and interest are all expected to increase.

Open OHV use would impact cultural resources or traditional use areas. Impacts would include damage and breakage of artifacts, erosion, soil compaction, and loss of ground cover. In addition, accompanying auditory, olfactory, and visual elements would be introduced and alter some of the traditional use areas. Expanded access to remote areas would increase vandalism of the cultural resource and general degradation of the historic and natural landscape.

Limiting OHV use and the number of roads and trails would reduce impacts to cultural resources.

If cultural resource sites were uncovered through climate-related changes or if existing cultural sites became endangered through the impacts of climate change, such as accelerated erosion from more intensive rainfall episodes, sites would potentially be affected and damaged. Therefore, the significance of the sites would be reviewed and subjected to the variety of mitigation measures for protection, if deemed necessary.

Because certain cultural resources in the planning area (such as NHTs, the Cedar Creek Battlefield, the Long Medicine Wheel and Walstein Area) have been identified or nominated as special designations (Congressionally Designated NHTs and ACECs), they are addressed under the Special Designations section rather than here.

ALTERNATIVE A (No Action)

Summary Statement

All management actions resulting in surface-disturbing activities would have the potential to cause impacts to cultural resources similar to those described under *Impacts Common to all Alternatives* if sites were not avoided. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 75,000 acres of surface-disturbing activities considered under Alternative A would potentially encounter 750 sites in the planning area that would be affected by management actions potentially impacting from 75 (10%) to 110 (15%) eligible properties. However, adherence to the cultural resource laws and regulations, project abandonment, project redesign, or, as a last resort, mitigation of adverse impacts in most instances, would minimize or mitigate possible impacts.

Resources and Resource Uses

Although all cultural ACECs would contain NSO stipulations for oil and gas leasing and development, other surface-disturbing activities would be allowed within ACEC boundaries, which would jeopardize the cultural values of these ACECs. These management actions would subject the battlefield sites and those portions of the sites designated ACECs to particular risk.

A number of sites (seven) have been designated to the scientific use category, although no cultural sites at present have been designated for conservation use, traditional use (socio-cultural use), or public use. However, none of these sites could be protected with an NSO stipulation; subsequently, the sites would potentially be subject to impacts from oil and gas development. Additionally, cultural sites or districts that met the criteria for allocation for designation of scientific use, conservation use, traditional use (socio-cultural use), public use, or experimental use; or sites or districts eligible for (or included on) the NRHP; or traditional cultural properties (TCPs) (none have been designated at this time) or sites or areas designated as such; or sites or areas that meet the criteria for allocation for designation for traditional use (socio-cultural use) for cultural properties would be potentially subject to impacts from oil and gas development (without an NSO stipulation) or other surface-disturbing actions.

ALTERNATIVE B

Summary Statement

All management actions resulting in surface-disturbing activities would have the potential, although remote, to cause impacts to cultural resources similar to those described under *Impacts Common to all Alternatives* if sites were not avoided. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. Surface-disturbing actions considered under Alternative B would potentially encounter approximately 360 sites in the planning area that would potentially be affected by management actions. The 36,000 acres of surface-disturbing activities considered under Alternative B would potentially encounter 360 sites in the planning area that would be affected by management actions potentially impacting from 36 (10%) to 54 (15%) eligible properties. However, adherence to the cultural resource laws and regulations, project abandonment, project redesign, or, as a last resort, mitigation of adverse impacts in most instances, would minimize or mitigate possible impacts.

Resources and Resource Uses

Restricting surface-disturbing activities and oil and gas leasing with an NSO stipulation for oil and gas leasing and development within 0.5 miles of site boundaries would also include cultural properties that met the criteria for allocation for designation to particular use categories, cultural properties eligible for or included on the NRHP, cultural properties determined to be of particular importance to American Indian groups, TCPs (in accordance with National Register Bulletin 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties*; Parker and King 1998), and those areas designated for traditional use. Such properties would include (but are not limited to) burial locations, pictograph or petroglyph sites, vision quest locations, plant-gathering locations, and areas considered sacred or used for religious purposes.

Surface-disturbing activities and oil and gas leasing would be restricted under Alternative B with buffers and NSO stipulations for oil and gas leasing and development in some sites or areas, which would curtail surface-disturbing activities on BLM-administered lands and diminish impacts to cultural resources. The most protection would be provided to the Fort Union Historic Site National Historic Landmark (NHL), Rosebud Battlefield NHL, Battle Butte Battlefield (Wolf Mountain) NHL, Hagen NHL and the NRHP-nominated Cedar Creek, Reynolds, and Ash Creek Battlefields. Designating or expanding the areas covered by ACEC designations under this alternative would protect specific cultural and battlefield sites.

ALTERNATIVE C

Summary Statement

All management actions resulting in surface-disturbing activities would have the potential, although remote, to cause impacts to cultural resources similar to those described under *Impacts Common to all Alternatives* if sites were not avoided. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 73,000 acres of surface-disturbing actions considered under Alternative C would potentially encounter 730 sites in the planning area that would be affected by management actions potentially impacting from 73 (10%) to 110 (15%) eligible properties. However, adherence to the cultural resource laws and regulations, project abandonment, project redesign, or, as a last resort, mitigation of adverse impacts in most instances, would minimize or mitigate possible impacts.

Resources and Resource Uses

Alternative C would moderately curtail surface-disturbing activities on BLM-administered lands, diminish impacts to cultural resources, and improve protection of these resources. Buffers for surface-disturbing activities and NSO stipulations would protect some important and significant cultural sites, including sites designated to particular use categories; sites eligible for or included on the NRHP; sites designated TCPs; and sites in the Fort Union Historic Site NHL, Rosebud Battlefield NHL, Battle Butte Battlefield (Wolf Mountain) NHL, Hagen NHL, and the NRHP-nominated Cedar Creek, Reynolds, and Ash Creek Battlefields. Protections would also be offered to specific cultural and battlefield sites by designating or expanding the areas covered by ACEC designations in the Battle Butte (Wolf Mountain), Reynolds, and Cedar Creek Battlefields; the Long Medicine Wheel and Walstein areas; and the Yonkee site.

If large developments occurred outside the site boundaries and proposed buffer areas, they would potentially still impact the setting and feeling of sites in the Rosebud Battlefield NHL; Battle Butte Battlefield (Wolf Mountain) NHL; Hagen NHL; and the NRHP-nominated Cedar Creek, Reynolds, and Ash Creek Battlefields.

ALTERNATIVE D

Summary Statement

All management actions resulting in surface-disturbing activities would have the potential, although remote, to cause impacts to cultural resources similar to those described under *Impacts Common to all Alternatives* if sites were not avoided. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 80,000 acres of surface-disturbing activities considered under Alternative D would potentially encounter 800 sites in the planning area that would potentially be affected by management actions potentially impacting from 80 (10%) to 120 (15%) eligible properties. However, adherence to the cultural resource laws and regulations, project abandonment, project redesign, or, as a last resort, mitigation of adverse impacts in most instances, would minimize or mitigate possible impacts.

Alternative D would slightly curtail surface-disturbing activities on BLM-administered lands, which would diminish impacts to cultural resources and increase protection of cultural resource values. Alternative D would provide minimal protection for important and significant cultural sites in the form of buffers (for surface-disturbing activities and oil and gas leasing) around sites designated to particular use categories, sites eligible for or included on the NRHP, and those designated a TCP.

Resources and Resource Uses

CSU stipulations for oil and gas leasing and development would offer minimal protections from oil and gas development activities in the Fort Union Historic Site NHL, Rosebud Battlefield NHL, Battle Butte Battlefield (Wolf Mountain) NHL, Hagen NHL, and the NRHP-nominated Cedar Creek, Reynolds, and Ash Creek Battlefields.

Designating or expanding the areas covered by ACEC designations to the Battle Butte (Wolf Mountain), Reynolds, and Cedar Creek Battlefields; the Long Medicine Wheel and Walstein areas; and the Yonkee site would protect specific cultural and battlefield sites.

If large developments occurred outside the site boundaries and proposed buffer areas, they would impact the setting and feeling of sites designated to particular use categories; sites eligible for or included on the NRHP; sites designated TCPs; and sites in the Fort Union Historic Site NHL, Rosebud Battlefield NHL, Battle Butte Battlefield (Wolf Mountain) NHL, Hagen NHL, and the NRHP-nominated Cedar Creek, Reynolds, and Ash Creek Battlefields.

ALTERNATIVE E (Proposed)

Summary Statement

All management actions resulting in surface-disturbing activities would have the potential, although remote, to cause impacts to cultural resources similar to those described under *Impacts Common to all Alternatives* if sites were not avoided. Impacts would differ across the alternatives only by the number of acres and resources that would be affected by proposed management actions. The 79,000 acres of surface-disturbing activities considered under Alternative E would potentially encounter 790 sites in the planning area that would potentially be affected by management actions potentially impacting from 79 (10%) to 120 (15%) eligible properties. However, adherence to the cultural resource laws and regulations, project abandonment, project redesign, or, as a last resort, mitigation of adverse impacts in most instances, would minimize or mitigate possible impacts.

Alternative E would moderately curtail surface-disturbing activities on BLM-administered lands, diminish impacts to cultural resources, and improve protection of these resources. Surface-disturbing activities and oil and gas leasing would be restricted under Alternative E with NSO stipulations for oil and gas leasing and development on significant cultural resource sites or areas, which would curtail surface-disturbing activities on BLM-administered lands and diminish impacts to significant cultural resource sites.

Resources and Resource Uses

Protection would be provided to the Fort Union Historic Site NHL, Rosebud Battlefield NHL, Battle Butte Battlefield (Wolf Mountain) NHL, Hagen NHL and the NRHP-nominated Cedar Creek, Reynolds, and Ash Creek Battlefields. Designating or expanding the areas covered by ACEC designations under this alternative would protect specific cultural and battlefield sites. This alternative would also protect specific cultural and battlefield sites by designating or expanding the areas covered by ACEC designations in the Battle Butte (Wolf Mountain), Reynolds, and Cedar Creek Battlefields; the Long Medicine Wheel and Walstein area.

If large developments occurred outside the site boundaries and proposed buffer areas, they would impact the setting and feeling of sites in the Fort Union Historic Site NHL, Rosebud Battlefield NHL; Battle Butte Battlefield (Wolf Mountain) NHL; Hagen NHL; and the NRHP-nominated Cedar Creek, Reynolds, and Ash Creek Battlefields.

CUMULATIVE IMPACTS

Cultural resources have been affected by past land uses for more than 100 years. Land uses include agricultural development from the homestead period onward (including farming and plowing native grassland prairies), railroad and highway development; land loss caused by community development and expansion; and mineral development (which includes open pit strip mining of coal and oil and gas development). These

past surface-disturbing activities affected cultural resources and continue to impact these values today on private, BLM-administered, and split-estate lands.

Significant cultural resources are those with the potential to yield information that adds to the understanding of history or prehistory. Only these cultural resources are fundamental to the evaluation of cumulative impacts. While non-NRHP-eligible properties do not typically contribute to the archeological record beyond their recordation, they are useful in providing information for the broader perspective of regional activities.

Typically, non-eligible sites are in advanced stages of erosion and their loss to natural processes already occurring. However, the loss of NRHP-eligible properties is offset, from an academic viewpoint, by mitigation through data recovery. These sites present an opportunity to expand the understanding of local and regional prehistory through excavation and analysis. Although avoidance of NRHP-eligible sites is generally preferred, the loss of some NRHP-eligible sites to data recovery efforts would not generally have an impact on cultural resources.

Site types with particular vulnerability to cumulative loss include rock art sites and rock structure sites. Cumulative loss of these site types exceeds the loss of mere archeological data because these site types represent, in a highly visual manner, unique examples of prehistoric occupations that can be appreciated by the public and the archeological and academic communities. These are also relatively fragile site types subject to erosion and vandalism. Avoidance of these fragile site types would be preferred, although not required if impacts were mitigated.

Although there is no consideration for sites remaining undiscovered because they are buried deeply, the total number of sites located during a Class III survey is a measure of site exposure caused by erosion. However, this number is only a sample of the actual number of sites present. Individual site type and quality determines their archeological value; therefore, management assessments that focus primarily on total site numbers would not accurately measure the cumulative impacts to the resource.

Consequently, individual evaluation of known cultural resource sites through avoidance of sensitive site types, and mitigation through data recovery of all disturbed NRHP-eligible sites would result in minimal cumulative impacts to cultural resources. Differences in impacts vary only by rate across the management alternatives.

Alternative A (No Action)

Under Alternative A, surface-disturbing activities on BLM-administered lands would continue as in the past, which would contribute to the projected decline in the number of cultural resources. Alternative A would not require buffers; NSO stipulations for oil and gas leasing and development; and ACEC designations that would offer additional protection of cultural resources.

Under Alternative A and *Impacts Common to all Alternatives*, 75,000 acres would be disturbed, which would impact 750 cultural resource sites if sites were not avoided. Actions would impact between 75 (10 percent) and 110 (15 percent) of cultural resource properties considered eligible for the NRHP.

Alternative B

Alternative B would not contribute to the decline in the number of cultural resources on BLM-administered lands because management actions under this alternative would not contribute to the present rate of surface disturbance. In addition, this alternative would provide protection for important and significant cultural sites through the implementation of buffers and NSO stipulations for oil and gas leasing and development. Specific cultural and battlefield sites would also be protected by new ACEC designations and the expansions of areas previously covered by ACEC designation. Protections for cultural resource values would be increased by the six new ACECs proposed under this alternative (four cultural and two paleontological areas). The paleontological areas designated under this alternative would include cultural resources.

Under Alternative B and *Impacts Common to all Alternatives*, 36,000 acres would be disturbed, which would impact 360 cultural resource sites if sites were not avoided. Actions would impact between 36 (10 percent) and 54 (15 percent) of cultural resource properties considered eligible for the NRHP.

Alternative C

Management actions under this alternative would contribute to a reduction in the current rate of decline of the number of cultural resource sites and increase protection of important and significant cultural resource sites. Alternative C would provide additional protection of important and significant cultural sites through buffers and NSO stipulations for oil and gas leasing and development. Specific cultural and battlefield sites would also be protected by new ACEC designations and the expansions of areas previously covered by ACEC designation. Protections for cultural resource values would be increased by the six new ACECs proposed under this alternative (four cultural and two paleontological areas). The paleontological areas designated under this alternative would include cultural resources.

Under Alternative C and *Impacts Common to all Alternatives*, 73,000 acres would be disturbed, which would impact 730 cultural resource sites if sites were not avoided. In addition, actions would impact between 73 (10 percent) and 110 (15 percent) of cultural resource properties considered eligible for the NRHP.

Alternative D

Management actions under this alternative would not stem the current rate of decline of the number of cultural resource sites appreciably. Alternative D would provide minimal additional protections to important and significant cultural sites through buffers and CSU stipulations for oil and gas leasing and development. Specific cultural and battlefield sites would also be protected by new ACEC designations and the expansions of areas previously covered by ACEC designations. Protections for cultural resource values would be increased by the six new ACECs proposed under this alternative (four cultural and two paleontological areas). The paleontological areas designated under this alternative would include cultural resources.

Under Alternative D and *Impacts Common to all Alternatives*, 80,000 acres would be disturbed, which would impact 800 cultural resource sites if sites were not avoided. These actions would impact between 80 (10 percent) and 120 (15 percent) of cultural resource properties considered eligible for the NRHP.

Alternative E (Proposed)

Management actions under this alternative would help contribute to a reduction in the current rate of decline of the number of cultural resource sites and increase protection of important and significant cultural resource sites through NSO stipulations for oil and gas leasing and development. Specific cultural and battlefield sites would also be protected by new ACEC designations and the expansion of areas previously covered by ACEC designations. Protections for cultural resource values would be increased by the four new ACECs proposed under this alternative (four cultural and two paleontological areas). The paleontological areas designated under this alternative would include cultural resources.

Under Alternative E and *Impacts Common to all Alternatives*, 79,000 acres would be disturbed, which would impact 790 cultural resource sites if sites were not avoided. In addition, actions would impact between 79 (10 percent) and 120 (15 percent) of cultural resource properties considered eligible for the NRHP.

PALEONTOLOGICAL RESOURCES

Paleontological resources are defined as any fossilized remains, traces, or imprints of organisms, preserved in or on the Earth's crust, that are of paleontological interest and that provide information about the history of life on Earth. If these resources are found to be scientifically significant, federal regulations require that impacts to them be assessed and impact mitigation measures be instituted to help protect them.

Adverse impacts to significant paleontological resources typically result in a loss of information and/or a loss of integrity of the resource. Adverse impacts to significant paleontological resources on BLM-administered lands include actions that physically damage or destroy all or parts of a resource and lack of protective action, which can result in resource deterioration. Adverse impacts to paleontological resources also result from increases in access to areas containing paleontological resources, which can lead to increases in use, erosion, looting, and vandalism.

Paleontological resources are important for their scientific-data potential. Adverse impacts to these resources are considered long-term, because once the resources are damaged or disturbed, impacts cannot be reversed.

Beneficial impacts to paleontological resources result from special management measures that can enhance the quality of a resource. Stabilization and recovery of paleontological resources and information are examples of long-term beneficial impacts. Erosion control at paleontological localities is another example of beneficial impacts. The beneficial impacts of erosion-control measures would be long-term, but eventually, adverse natural and/or human influences would require more measures to keep paleontological resources from degrading.

SUMMARY OF IMPACTS

Impacts to paleontological resources vary by alternative. Alternatives A, D and E are similar in their protections but Alternative D and E generally provides more protections than Alternative A. Alternative B provides the most protection, followed by Alternative C, and then alternatives D and E. As for specific resources, Alternative B, C, D and E provides for management to protect the Flat Creek Paleontological Area (339 acres); Powderville Paleontological Area (Alts B, C, D: 27,151 BLM-administered surface acres; Alt E: 9,518 acres), and the Walstein Area (1,519 acres) as ACECs.

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in this impact analysis include the following:

- Paleontological resources are most typically associated with bedrock exposures. Areas of deep soils, alluvium, or colluvium only rarely contain significant fossils. Therefore, the main areas of concern for impacts to paleontological resources are where fossil-bearing bedrock is at or near the surface, such as badlands, hill slopes, or areas with thin soils over bedrock.
- Vertebrate fossils continue to be found throughout the Cretaceous, and Tertiary units exposed in the planning area. The Cretaceous aged Hell Creek and Lance and the Tertiary Tullock member of the Fort Union Formation are the most important geologic formations for significant paleontological resources, but several other sedimentary formations are known to contain important fossils.
- Surface-disturbing and surface-disruptive activities can dislocate or damage previously undiscovered significant paleontological resources (i.e., unanticipated discoveries) but may also result in their discovery. Destruction of these resources results in a loss of scientific information and precludes interpretation of the resource values to the public.
- Surveys required before surface disturbance in areas known or suspected to contain significant paleontological resources can result in the identification and evaluation of previously undiscovered resources. In addition, continuing scientific research in the planning area will identify new paleontological resources. The BLM will then manage these newly discovered resources accordingly.
- The number of paleontological resources affected by various actions correlates directly to the degree, nature, and quantity of surface-disturbing activities in the planning area.

All vertebrate fossils are considered significant. Paleontological resources would be evenly distributed across the landscape within the significant Potential Fossil Yield Classification System (PFYC) formations rated 4 or 5 (Arikaree, 4; Tullock member of the Fort Union formation, 4; Hell Creek, 5; Lance, 5; and Judith River, 5) on 6.1 million acres of the planning area. Of these acres, 780,000 acres are BLM-administered surface acres and 1.7 million acres are BLM-administered oil and gas mineral estate acres. Significant PFYC formation areas account for 28 percent of BLM-administered surface acres and 29 percent of BLM-administered oil and gas mineral estate acres in the planning area.

Distribution of the 1,440 localities fully or partially located on BLM-administered land is equal to 1 locality per 1,909 acres (0.5 localities per 1,000 acres or 0.03 localities per 1 square mile [640 acres]) for the 2.8 million BLM-administered surface acres within the planning area. Nearly all of the 1,440 localities are located within the significant PFYC formation areas. Although management actions are considered evenly distributed across the landscape of the planning area and not necessarily restricted to just the significant PFYC formation areas, the above figures would apply. For this analysis, localities were assumed to be 0.5 acres in size, with an area of approximately 148 square feet.

The assumption of 1 paleontological locality for every 1,909 acres of BLM-administered lands is based on studies and findings conducted in the planning area (Aaberg, Hanna, Crofutt, Green, and Vischer 2006) and were calculated by averaging the number of localities discovered on BLM-administered lands before comparing this number to the number of BLM-administered surface acres in the planning area. Depending on their location in the planning area, the actual number of paleontological localities affected by a management action could vary dramatically.

There would be 10 to 15 paleontological excavations per year. Typical excavations cover approximately 0.5 acres each, resulting in 5 to 7.5 acres disturbed annually. Unless otherwise noted, surface-disturbing activities caused by resource use would be evenly distributed across the landscape.

The number of possible localities in significant PFYC areas on the 1.7 million acres of oil and gas mineral estate in significant PFYC formations would equal 885 possible localities in significant PFYC areas (oil and gas mineral estate acres divided by 1 locality per 1,909 acres).

Under existing oil and gas stipulations, surface occupancy is prohibited within designated paleontological localities on BLM-administered minerals in the planning area; however, none exist at this time except those that have been designated ACECs. A modification or waiver may be applied for and, provided the paleontological resource values could be protected or undesirable impacts mitigated, an exception would be granted. The collection of vertebrate paleontological remains on BLM-administered surface would be conducted under a valid paleontological resources use permit, and reasonable, noncommercial collections of invertebrate fossils and fossil plants would be allowed under 43 CFR 8365.1. The collection of petrified wood would be allowed under the terms of 43 CFR 3622.

IMPACTS COMMON TO ALL ALTERNATIVES

Surface disturbance, neglect, erosion, natural deterioration, and looting and vandalism frequently impact paleontological resources in the planning area. The most common cause of impacts is surface disturbance, especially in areas of industrial development. The more mineral and realty activities likely to occur, the more impacts to paleontological resources are likely, particularly in those areas where significant formations are exposed at the surface.

Standard procedures have been developed to help address impacts to significant paleontological resources, and include archival research, on-the-ground inventories, locality recordation and evaluation, data recovery excavations, condition assessments, stabilization, and, in certain cases, avoidance. These standard procedures can protect paleontological resources from damage where paleontological resources are known or discovered. All of the alternatives are guided by these standard procedures.

However, implementing standard procedures does not ensure the identification of all paleontological resources before they are affected. This happens when paleontological resources are buried and are not visible from the surface. These resources are often only discovered after surface-disturbing activities have uncovered them, and construction activities can quickly and severely damage them and result in the loss of much data. This happens regularly in the planning area because paleontological resources are often buried by sediments and soils. In such cases, mitigation of impacts to significant paleontological resources usually entails data recovery and salvage excavations. These excavations are designed to retrieve the remaining data from the locality and study the data to determine what kinds of organisms lived there in the past.

Any management action that would result in surface-disturbing activities, including the use of heavy equipment and OHV use, would have the potential to impact paleontological resources. These surface-disturbing activities would potentially alter the characteristics of paleontological resources through resource damage, fossil destruction, or disturbance of the stratigraphic context in which paleontological resources are located, which would result in the loss of important scientific data.

The BLM recognizes the importance of scientific study to retrieve and interpret important paleontological resource information. For this to occur, significant localities must be preserved intact if possible prior to the study. Actions would need to be taken to protect localities by avoiding any disturbance, which would often mean relocating the activity. Because information contained in the stratigraphic and environmental context of paleontological resources is of primary importance to paleontological study, the removal of fossilized remains from their original location destroys this context and information. Ensuring that paleontological resources were available for scientific study would increase the paleontological resource database and scientific body of knowledge. Recovery or preservation of data from new resources would require notification of the BLM and scientific community.

Because information loss is inherent to excavations, data recovery efforts would cause residual impacts to paleontological resource values; although mitigation by excavation would recover valuable data, the process of excavation, using even the most current methods and technology that would employ the best data recovery practices, would cause the destruction of and loss of some data. Subsequently, these data would not be available for future study when better analytical techniques may be available.

Construction and associated surface-disturbing activities would potentially cause impacts to unknown paleontological resources. The excavation and removal of paleontological remains would impact paleontological resources through surface-disturbing activities such as overburden removal, the use of heavy earth-moving equipment, and road or trail construction or use. Any surface-disturbing activity that would occur under the jurisdiction of other entities on lands transferred, leased, or sold from BLM administration would have the potential to impact paleontological values.

Surface-disturbing activities would also have the potential to expose paleontological resources buried or overlooked during review inventories that would otherwise remain unknown. Paleontological resource surveys and detailed pedestrian surveys conducted prior to surface-disturbing activities would potentially locate additional paleontological resources and result in a better understanding of the nature and distribution of these resources. Additionally, prior to authorizing and permitting surface-disturbing actions, the BLM would require that a paleontological resource assessment (based on the PFYC) be conducted in the area to determine the potential for paleontological resources. If it were likely that paleontological resources were present, a paleontological resource inventory would be conducted.

Although surface-disturbing activities would potentially disturb or destroy buried paleontological resources, activities at significant localities would be mitigated through data recovery during excavation. If paleontological resources were located during these surveys, mitigation measures would be implemented, which would include additional sampling; excavation monitoring; or collection, excavation, and curation of scientifically significant fossils.

Adherence to the paleontological resource laws and regulations, in most instances, would minimize and mitigate impacts to paleontological resources. Paleontological resource inventories may be required prior to the commencement of surface-disturbing activities, which would identify paleontological resources and avoid or mitigate significant sites prior to surface disturbance. Guidance for predicting, assessing, and mitigating paleontological resources is found in BLM Instruction Memorandum No. 2009-011 (BLM 2008b). To mitigate potential impacts to paleontological resources, “unanticipated fossil discovery plan” stipulation will be added to all stipulations or conditions of approval for all surface disturbing actions.

Avoiding paleontological localities in a project area would be a BMP. For most surface-disturbing activities, paleontological resources would be avoided by project redesign or relocation, which would eliminate the need for mitigation measures. If paleontological resources were found during an inventory, attempts would be made to move and relocate the proposed activity to an area without paleontological resource values or in which the

activity would not impact paleontological resources. If paleontological resources were not present on the surface but the area was in a significant PFYC Class 3, 4, or 5, a monitoring plan would be implemented during surface-disturbing activities. Should a paleontological locality be unavoidable, activities at significant localities would be mitigated prior to project authorization.

Avoiding paleontological localities discovered by federal actions and avoiding paleontological localities by project abandonment, project redesign, or, as a last resort, mitigation of adverse impacts through data recovery or other alternative means would ultimately benefit paleontological resource values by helping to preserve and protect the range of paleontological resource values located on BLM-administered lands. However, these actions would potentially relocate activities and impact paleontological resources. Avoiding paleontological localities through project abandonment or project redesign would be preferred because any data recovery effort would cause residual impacts from the data loss inherent to archeological excavations.

For federal actions within the significant PFYC formations (those rated 4 or 5), the BLM would require that a paleontological resource inventory be conducted to determine the presence of paleontological resources prior to authorizing and permitting these areas.

An activity that could not be relocated that was found to be affecting a paleontological locality available for scientific study would require mitigation under *Impacts Common to all Alternatives*. If a significant property were affected by natural means, such as erosion, steps would be taken to reduce these impacts and prevent further degradation. The property would also potentially be subjected to salvage mitigation measures.

Under all alternatives, managing paleontological resource values by identifying, monitoring, protecting, and preserving significant paleontological resources in accordance with BLM policy and manuals would ultimately result in benefits to paleontological resource values. These actions would help preserve and protect the range of paleontological resources values located on BLM-administered lands.

The standard procedures also do not apply to small locatable mineral exploration projects. Locatable minerals exploration projects of fewer than five acres are subject to the 43 CFR 3809 “Notice of Intent” regulations, which offer minimal protections to paleontological resources. These operations do not require BLM approval, and fossil localities may be adversely impacted if mining operations proceed.
Impacts to paleontological resources from oil and gas development within the MLP area would be the same as those described for oil and gas development outside of the MLP area.

The limitations on the use of prescribed fire and full suppression described in the Cultural Resources section would be equally true for paleontological resources. Fire would have the potential to impact paleontological materials. Accelerated erosion or the removal of vegetative cover during fire events would result in exposure of paleontological values to vandalism or illegal collection. Wildfire would potentially be more destructive to paleontological resources than prescribed fire because it would include impacts from both uncontrolled fire and fire suppression activities. Actions that allowed prescribed fire would also consider impacts from fireline disturbances.

In some extreme circumstances, paleontological values would be damaged or destroyed by fire suppression efforts critical to protect human life or property. However, under standard protocols, impacts to known paleontological values would be considered and mitigated. Under *Impacts Common to all Alternatives*, paleontological surveys would be conducted in areas within the significant PFYC formations to identify paleontological values prior to fire ignition ; if paleontological resources were present, vehicle and equipment servicing and refueling areas would be relocated. Avoidance would be the standard field operating procedure employed. Fire rehabilitation efforts would generally increase the protection of paleontological values by preventing or reducing erosion and encouraging rapid re-vegetation of denuded surfaces. Potential impacts from rehabilitation activities (such as mechanical reseeding) would be mitigated by standard procedures.

Climate change impacts would have the potential to affect paleontological materials. Accelerated erosion resulting from heavy precipitation or evolving vegetative communities could result in exposure of paleontological values to vandalism or illegal collection. Areas with accelerated erosion in significant PFYC areas 3, 4 and 5 would be monitored to identify new exposure of paleontological materials.

Livestock grazing would impact paleontology localities through trampling, trailing, and rubbing. Impacts on surface localities and fossils would include fossil damage and disturbance of locality context and integrity of material association. Cattle trailing, particularly along fencelines and to and from water sources, would create ruts that would expose localities and fossils and cause accelerated erosion and damage and loss of localities and paleontological information. Livestock would remove vegetation, which would cause increased erosion and expose paleontological properties to additional impacts. Localities along major streambanks would be subject to livestock-caused streambank erosion.

Another impact to paleontological resources common to all alternatives results from increased public use of lands, which can result for several reasons, including improved access to formerly remote areas, which is common in areas where development allows for the creation of new roads; the increased popularity and availability of OHVs, which also allows access to formerly remote areas; and increased public interest in paleontological sites or areas. As public use of lands increases, so does the impact to paleontological resources. As there is more use, more paleontological resources are visited or driven over, and some of these resources are looted or vandalized. These impacts would occur under any of the alternatives because access, OHV use, and public use and interest are all expected to increase.

Impacts from OHV use would include crushing, breaking, and scattering of paleontological material; soil compaction from vehicle wheel pressure; and the intensified soil erosion processes caused by the removal of protective ground cover (such as vegetation and natural clutter), particularly when ruts and trails were created by repeated crossings. Shallow paleontological resources would be particularly vulnerable to disturbance by OHV-caused ruts and trails. Limiting OHV use would reduce the number of roads and trails available for use and subsequently reduce impacts to paleontological resource values. Increased accessibility to remote areas would potentially result in vandalism and illegal fossil removal by unpermitted fossil collectors.

Information contained in the stratigraphic and environmental context of paleontological resources is of primary importance to paleontological study; subsequently, the removal of fossilized remains from their original locations destroys this context and information. OHV use by vandals would allow quick, often undetected collection of the information or objects, facilitate transport of fossil remains too heavy to transport by foot, and allow transport over long distances.
Land tenure adjustments and increased public accessibility to fossils would lead to looting or vandalism activities according to BLM Washington Office (WO) IM No. 2009-011 (BLM 2008b). Vandalism and illicit collection is influenced by accessibility, which is one of the major factors affecting vandalism rates, and visitation to areas. Increased visitor use to some areas would lead to an increase in vandalism, illicit collection, littering, and disturbance of paleontological localities. Although vandalism would also increase in previously inaccessible areas, it would be reduced if road and trail restrictions left substantial, contiguous portions of public lands isolated from motorized travel.

Surface-disturbing activities, including the use of heavy equipment and OHV use, would alter the characteristics of paleontological resources, damage or destroy fossils, or disturb the stratigraphic context in which they are located and result in the loss of important scientific data. Information contained in the stratigraphic and environmental context of paleontological resources is of primary importance to paleontological study and the removal of fossilized remains from their original location destroys this context and information. If the new landowner allowed surface-disturbing activities, the same impacts would occur on lands removed from BLM administration.

Over the long-term, surface-disturbing activities, land tenure adjustments, oil and gas development, coal leasing, and surface-disturbing activities associated with activities occurring on BLM-administered lands would identify 910 paleontological properties under this alternative. Surface-disturbing activities that would impact, disturb, or destroy buried paleontological properties would result in the loss of previously undetected, buried paleontological resource values and data.

Under all alternatives, proposed Paleontological Resources management actions would be sufficient to protect the many valuable paleontological resources in the planning area.

ALTERNATIVE A (No Action)

Summary Statement

All management actions resulting in surface-disturbing activities would cause impacts to paleontological resources similar to those described under *Impacts Common to all Alternatives*. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 75,000 acres of surface-disturbing activities considered under Alternative A are projected to impact 39 localities in the planning area.

Resources and Resource Uses

Although all paleontological ACECs would be subject to an NSO stipulation for oil and gas leasing and development under this alternative, other surface-disturbing activities would be allowed in these areas, which would jeopardize the paleontological values of these ACECs. Because the proposed Powderville Paleontological Area (9,518 acres) ACEC, the proposed expanded Flat Creek Paleontological Area (339 acres) ACEC would not be protected by ACEC designation or an NSO stipulation for oil and gas leasing and development and would have no protection from surface-disturbing activities, it would be at particular risk under this alternative.

ALTERNATIVE B

Summary Statement

All management actions resulting in surface-disturbing activities would cause impacts to paleontological resources similar to those described under *Impacts Common to all Alternatives*. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 36,000 acres of surface-disturbing activities considered under Alternative B would impact 19 localities in the planning area.

Resources and Resource Uses

Under this alternative, paleontological resources values and specific paleontological localities or areas would be protected through the designation or expansion of areas covered by ACEC designations to the Flat Creek (547 acres) and Powderville Paleontological Areas (29,571 acres). Under this alternative, paleontological ACECs would be subject to an NSO stipulation for oil and gas leasing and development and other surface-disturbing activities would be restricted within the ACEC boundaries. The proposed Powderville and expanded Flat Creek ACECs would be protected from surface-disturbing activities under this alternative.

ALTERNATIVE C

Summary Statement

All management actions resulting in surface-disturbing activities would cause impacts to paleontological resources similar to those described under *Impacts Common to all Alternatives*. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 73,000 acres of surface-disturbing activities considered under Alternative C would impact 38 localities in the planning area.

Resources and Resource Uses

Over the long-term, surface-disturbing activities, land tenure adjustments, and oil and gas development would be reduced from current levels but still impact paleontological localities and necessitate mitigation.

Under this alternative, the Ash Creek Divide, Hell Creek, Bug Creek, and Sand Arroyo paleontological ACECs would be subject to an NSO stipulation for oil and gas leasing and development and other surface-disturbing

activities would be restricted within the ACEC boundaries. The proposed Powderville and expanded Flat Creek ACECs would be protected with a buffer area for surface-disturbing activities within 300 feet of the boundary of significant localities and within 300 feet of localities within the proposed ACECs.

ALTERNATIVE D

Summary Statement

All management actions under Alternative D that would result in surface-disturbing activities would cause impacts similar to those described under *Impacts Common to all Alternatives*. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 80,000 acres of surface-disturbing activities considered under Alternative D would impact 42 localities in the planning area.

Resources and Resource Uses

Paleontological Resources management actions that required 300-foot buffers and CSU stipulations for oil and gas leasing and development activities and restricted surface-disturbing activities would not, in the long-term, protect paleontological resource values from oil, gas, and surface-disturbing activities if large developments occurred adjacent to paleontological locality boundaries.

Under this alternative, the Ash Creek Divide, Hell Creek, Bug Creek, and Sand Arroyo paleontological ACECs would be subject to an NSO stipulation for oil and gas leasing and development and other surface-disturbing activities would be restricted within the ACEC boundaries. The Powderville and expanded Flat Creek ACECs would be minimally protected (particularly those within the proposed ACECs) with 300-foot buffers.

ALTERNATIVE E (Proposed)

Summary Statement

All management actions resulting in surface-disturbing activities would cause impacts to paleontological resources similar to those described under *Impacts Common to all Alternatives*. Impacts would differ across the alternatives only by the number of acres and resources affected by proposed management actions. The 79,000 acres of surface-disturbing activities considered under Alternative E would impact 41 localities in the planning area.

Resources and Resource Uses

Under this alternative, the Ash Creek Divide, Hell Creek, Bug Creek, Sand Arroyo, Flat Creek, and Powderville paleontological ACECs would be subject to an NSO stipulation for oil and gas leasing and development and other surface-disturbing activities would be restricted within the ACEC boundaries.

CUMULATIVE IMPACTS

Fossil-bearing rocks underlie the entire planning area. Although fossils are rare in most rock layers, five geologic rock units in the planning area are known to contain significant fossil material: the Judith River formation, the Hell Creek formation, the Lance formation (which is the same age as the Hell Creek formation), the Tullock member (and its equivalent in the Ludlow member) of the Fort Union formation, and the Arikaree formation. Rock exposures that produce significant fossils, particularly vertebrate fossils, are rare and of considerable scientific value and interest.

Since visibility of the bedrock is an important factor in fossil recovery, paleontological resources are affected primarily by erosion that exposes fossil-bearing formations. Additionally, because most fossils are discovered and recovered as scattered surface finds, visibility of the bedrock is an important factor in fossil discovery and recovery. The climate in eastern Montana more often exposes, rather than buries, these formations.

Surface fossils are subject to various impacts and a wide range of land uses has affected areas of significant formations for more than 100 years. These land uses include agricultural development from the homestead period onward (including farming and plowing native grassland prairies); railroad and highway development; land loss resulting from community development and expansion; and mineral development (including open-pit strip mining of coal and oil and gas development). The wide range of surface-disturbing activities accompanying past development affected paleontological resources, continues to impact paleontological resource values today, and is expected to continue to increase impacts on paleontological resources on all lands.

Management actions provide a systematic and proactive means to address direct impacts of authorized projects and activities on paleontological resources. Although mitigation through data recovery at paleontological sites would recover information relevant to current research concerns, these activities would also permanently remove the resource from future research and interpretive use, which would constitute an irretrievable and irreversible commitment of these resources. Any management actions that caused the inadvertent destruction of paleontological resources or made them susceptible to illegal collection would potentially lead to the loss of these resources. Potential impacts to paleontological resources would potentially be caused by actions for vegetation management; recreation; travel route closures and development; wildfire; wildfire suppression; mineral, oil, and gas development; population increases; and vandalism.

Other regional land uses and economic development planning would potentially impact the types and intensity of land uses within the planning area as well as the regional paleontological resources. Development of lands, unprotected by federal or state paleontological statutes and regulations, would potentially, further decrease the resource base and limit paleontological resource management opportunities in the planning area. Planning coordination at the regional level would potentially help protect important paleontological resource values.

An evaluation of the cumulative impacts to paleontological resources considers the number of localities destroyed in relationship to the number of existing localities. However, this figure does not correlate to a threshold at which there is an unacceptable loss of paleontological resources. Evaluation of the paleontological resources in the planning area considers individual localities, type, and quality. Although there is no consideration for buried localities that remain undiscovered, the total number of localities discovered during a paleontological survey is a measure of the exposure (a result of erosion) of the formation and localities. However, this number is only a sample of the actual number of localities present. Because individual locality type and quality determines their paleontological value, management assessments that focus primarily on total locality numbers would not accurately measure the cumulative impacts to the resource.

Important or significant paleontological resources consist of all vertebrate fossils and those with the potential to yield information that would add to an understanding of geology and paleontology; only these paleontological resources are fundamental to the evaluation of cumulative impacts. However, all paleontological resources are useful in providing information to the broader perspective and understanding of regional scientific knowledge. These localities present an opportunity to expand local and regional scientific paleontological knowledge through excavation, removal, and analysis.

Although academic losses are offset by mitigation through data recovery, many paleontological resources, when discovered, are in advanced stages of erosion and already experiencing losses to natural processes. Additionally, although avoiding paleontological resources would generally be preferred, the loss of some paleontological resources to data recovery efforts does not generally impact paleontological resources. Consequently, avoiding sensitive localities and implementing mitigation through data recovery of all disturbed localities would result in minimal cumulative impacts to paleontological resources.

Alternative A (No Action)

Management actions under Alternative A would contribute to the declining number of paleontological resources and continue to increase impacts to paleontological resources through minimal protection of important and significant paleontological localities or areas.

Under Alternative A, surface-disturbing activities on BLM-administered lands would continue as in the past, which would contribute to the projected decline in the number of paleontological resources in the planning area. Alternative A would not protect important and significant paleontological localities with buffers; NSO stipulations for oil and gas leasing and development; or ACEC designations.

Under Alternative A and *Impacts Common to all Alternatives*, 75,000 total acres of disturbance would impact 39 paleontological resources in the planning area.

Alternative B

Under Alternative B, surface-disturbing activities on BLM-administered public lands would be greatly curtailed, which would diminish impacts to paleontological resources and greatly improve protection of paleontological resource values. Alternative B would not contribute to the decline in the number of paleontological resources on BLM-administered lands and would provide protection for important and significant paleontological localities through 0.5 mile-buffers; NSO stipulations for oil and gas leasing and development; and surface-disturbing restrictions.

Under this alternative, proposed management actions would be sufficient to protect the many valuable paleontological resources in the planning area. The Ash Creek Divide, Hell Creek, Bug Creek, and Sand Arroyo paleontological ACECs would be subject to an NSO stipulation for oil and gas leasing and development and other surface-disturbing activities would be restricted within the ACEC boundaries. The proposed Powderville and Flat Creek ACECs would also be protected from surface-disturbing activities under this alternative.

Under Alternative B and *Impacts Common to all Alternatives*, 36,000 acres of disturbance would impact 19 paleontological resources in the planning area.

Alternative C

Under Alternative C, surface-disturbing activities on BLM-administered lands would be moderately curtailed, which would diminish impacts to paleontological resources and moderately improve protection of paleontological resource values in the planning area. Although a wide range of surface-disturbing activities would occur and impact paleontological resources under Alternative C, the current rate of decline in the number of paleontological resource localities in the planning area would be reduced.

Alternative C would provide additional and moderate protection for important and significant paleontological localities in the form of 300-foot buffers for surface-disturbing restrictions and NSO stipulations for oil and gas leasing and development around areas designated paleontological localities. Moderate and additional protection would also be offered to paleontological resource values for future paleontological localities or areas that met the criteria for designation.

Proposed management actions would moderately and minimally protect the many valuable paleontological resources in the planning area. The Ash Creek Divide, Hell Creek, Bug Creek, and Sand Arroyo paleontological ACECs would be subject to NSO stipulations for oil and gas leasing and development and other surface-disturbing activities would be restricted within ACEC boundaries. The proposed Powderville and Flat Creek ACECs would be protected and contain buffers for surface-disturbing activities within the proposed ACECs.

Protection would also be offered to specific paleontological localities or areas by designating or expanding the areas covered by ACEC designations to the Flat Creek (547 acres) and Powderville Paleontological Areas (29,571 acres). However, no 300-foot buffers were proposed around the proposed paleontological ACECs under this alternative because these areas incorporate sufficient area around the existing paleontological resource values to provide adequate protection.

Under Alternative C and *Impacts Common to all Alternatives*, 73,000 acres of disturbance would impact 38 paleontological resources in the planning area.

Alternative D

Under Alternative D, surface-disturbing activities on BLM-administered public lands would be slightly curtailed, which would slightly diminish impacts to paleontological resources and slightly improve protection of paleontological resource values. This alternative would continue to contribute to the anticipated decline in the number of paleontological resource localities in the planning area. This alternative would offer some protection for paleontological resource values but also allow activities that would potentially cause resource damage.

Paleontological Resources management actions for oil and gas leasing and development under Alternative D would slightly curtail and diminish impacts to paleontological resources and slightly improve protection of paleontological resource values by providing minimal additional protection for important and significant paleontological resources.

Under this alternative, proposed management actions would offer minimal protection of the many valuable paleontological resources in the planning area, particularly those within ACECs. Although the proposed Powderville and Flat Creek Paleontological Areas would be designated ACECs (except for 50 acres of the Flat Creek area, which is a paleontological locality in which all surface-disturbing activities would be prohibited), these areas would receive little protection from surface-disturbing activities. Buffers were not proposed around the paleontological ACECs under this alternative because these areas incorporate sufficient area around the existing paleontological resource values to provide adequate protection.

Under Alternative D and *Impacts Common to all Alternatives*, 80,000 acres of disturbance would impact 42 paleontological resources in the planning area.

Alternative E (Proposed)

Under Alternative E, surface-disturbing activities on BLM-administered lands would be moderately curtailed, which would diminish impacts to paleontological resources and moderately improve protection of paleontological resource values in the planning area. A wide range of surface-disturbing activities would occur and impact paleontological resources under Alternative E, but the current rate of decline in the number of paleontological resource localities in the planning area would be reduced.

Alternative E would provide additional and moderate protection for important and significant paleontological localities in the form of NSO stipulations (and surface-disturbing restrictions) on areas designated paleontological localities. Moderate and additional protection would also be offered to paleontological resource values for future paleontological localities or areas that meet the criteria for designation.

Proposed management actions would moderately and minimally protect the many valuable paleontological resources in the planning area. All current paleontological ACECs would be subject to an NSO stipulation for oil and gas leasing and development and other surface-disturbing activities would be restricted within ACEC boundaries. The proposed Powderville and Flat Creek ACECs would be protected because surface-disturbing activities would be allowed only if they would not impact the quality and setting of significant paleontological localities within the ACECs.

Protection would also be offered to specific paleontological localities or areas by designating or expanding the areas covered by ACEC designations to the Flat Creek (547 acres) and Powderville Paleontological Areas (29,571 acres). However, under this alternative, no buffers were proposed around the proposed paleontological ACECs because these areas incorporate sufficient area around the existing paleontological resource values to provide adequate protection.

Under Alternative D and *Impacts Common to all Alternatives*, 79,000 acres of disturbance would impact 41 paleontological resources in the planning area.

VISUAL RESOURCES

SUMMARY OF IMPACTS

VRM Classes are designated within each alternative to represent an allowable level of impact based on an established VRM Class. VRM Classes range from I – IV with Class I allowing the least amount of change and IV allowing the most amount of change to the characteristic landscape.

The BLM's VRM class objectives were used in analyzing impacts on visual resources. These objectives provide a baseline for determining how much a proposed management action would affect visual resources or scenic quality, as well as determining the level of disturbance an area can support while still meeting visual resource objectives. Opportunities, experiences, and public benefits would be tied to the physical setting of a landscape. VRM classifications determine the allowable level of visual impact in specific areas while maintaining the efficacy of land-use allocations for activities in other resource areas. Limitations for visual intrusions in VRM Class I and VRM Class II areas are intended to retain or improve the quality of visual resources while VRM Class III and IV allow a greater number of visual contrasts associated with development and resource management activities. In addition, the VRM inventory was updated during this RMP process, so the updated inventory is analyzed within Alternatives B, C, and D. Under Alternative A, the majority of the planning area would be located within VRM Class IV areas, the MCFO would use VRM Class I designations in all WSAs, VRM Class II designations would be used primarily along highway and river corridors, and VRM Class III areas would be used along county roadways.

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in this impact analysis include the following:

- Scenic resources would remain in demand within the planning area over the life of this RMP.
- Increasing tourism would increase the value of open spaces and undeveloped landscapes.
- Surface disturbances will adversely impact visual resources. Surface disturbances will introduce new visual elements onto the landscapes or intensify existing visual elements, altering the line, form, color, and/or texture that characterize the existing landscape.
- VRM objectives (in Classes I and II) will be reached more effectively and efficiently through complementary allowable use decisions (e.g. NSO) that include exception criteria that match the allowable change levels described for VRM Class objectives.
- Higher visual protections will be afforded to scenic ACECs; therefore designating scenic ACECs will benefit the visual resource.
- VRM Class III and IV areas allow moderate to high levels of change to the characteristics of the landscape.

IMPACTS COMMON TO ALL ALTERNATIVES

Changes in air quality, either from smoke, dust, haze, or other pollutants would potentially reduce or degrade scenic quality by obscuring distant views in the short-term and long-term. Utilizing emission reduction BMPs would mitigate adverse impacts caused from air quality issues.

Soils, vegetation, and special status plants would all contribute to the natural appearance of the landscape for all VRM classes, which would enhance visual qualities for the casual observer.

Vegetative manipulation (or prescriptive) treatments using chemical, fire, biological, manual, and mechanical means would impact the visual landscape in all VRM classes. Although VRM Class IV areas allow for major modification of the existing character of the landscape, vegetation changes would impact qualities such as patterns, forms, and texture. Within a VRM Class IV management objective area, every attempt should be made to minimize impacts through location considerations, emphasis on minimal disturbance, and element repetition. Although impacts would depend on spatial arrangements, vegetation mosaics, and the activity's proximity to key observation points, impacts from this management action would typically be short-term. In

the long-term, vegetative treatments would improve visual qualities by eliminating decadent stands and rejuvenating vegetation.

Managing invasive species to improve the overall quality of public lands would contribute to the natural appearance of the landscape and, over the long-term, enhance the visual character of the landscape. Using manual, mechanical, and prescribed fire treatments would detract from the viewshed on a short-term basis by disrupting the line, color, and form of natural vegetation. Monitoring would also contribute to the natural appearance of the area by reducing the spread of invasive species.

Fire and fuels management actions using mechanical thinning, biomass removal, and chemical and biological treatments for resource objectives within VRM Class I and II areas, would detract from the existing visual elements of form, line, color, and texture. However, depending on spatial arrangement, vegetation mosaics, and the activity's proximity to key observation points, impacts from these management actions would typically be short-term. Visual impacts from dead, standing, and down woody material that occurred as a result of wildfire or prescribed burns would be short-term in duration and depend on factors such as the intensity and extent of a given burn, the rate of decay of the dead material, and the size and density of vegetation burned. In the long-term, fuel treatments would improve visual resource qualities by eliminating decadent stands and rejuvenating vegetation. In the short-term, fire suppression actions involving heavy equipment use would detract from the existing landscape by introducing new forms, lines, colors, and textures to the landscape.

Forest management actions would impact visual resources in areas in which dead or live tree removals were allowed. Although some of this product removal would occur in VRM Class II areas, mitigation measures would be used for site-specific projects (such as locating biomass removal activities in areas not readily visible from key observation points) and visual impacts in this area would be short-term. Forest health restoration projects that improved forest resiliency would impact VRM in the short-term; however, the benefits of implementation of these management actions would contribute to the natural viewshed of the VRM class in the long-term. If allowed near key observation points, commercial and personal use from forest or woodlands would have the potential to impact visual resources. Although salvage of dead and dying timber would be short-term in duration, salvage would improve visual resource qualities in the long-term by eliminating decadent stands and rejuvenating vegetation. Other resource values would be taken into consideration and could be beneficial to the VRM class in the long-term depending on those values.

New development would impact visual resources in VRM Class II, III, and IV areas. Closed, NSO, or timing stipulations that would be applied to all VRM Class I areas and VRM Class II designated areas would maintain the current scenic quality. These specific management actions would preserve or protect visual resources to the extent allowable under the VRM class objectives, with long-term impacts on scenic quality in these areas. Any development in VRM Class II areas would be mitigated to retain the scenic quality and avoid attracting the attention of the casual observer. Lasting the life of the project, periodic impacts would include dust and emissions from vehicles and facilities that contributed air pollution and haze in the region. The addition of structures (particularly wells, tanks, and power lines) to the landscape would have long-term impacts on the visual quality of the landscape by changing lines, colors, and textures of the landscape. Except where facilities were located on ridgelines, visual impacts of structures would be localized and only impact observers inside the viewsheds. Facilities placed on ridgelines would have a greater tendency to degrade multiple viewsheds because the structure extended above the horizon. Development activities would alter the character of the landscape by introducing contrasting elements against the natural landscape, which would be visually distracting to the casual observer. These management actions would alter the landscape from a predominately natural setting to a more industrialized setting by changing the area from one that is essentially free of human-made features to one dominated by roads, drill pads, and production facilities.

Because VRM Class IV objectives allow major modifications of the existing character of the landscape, oil and gas development and production facilities and CBNG development would be compatible with these objectives. However, visual settings of some areas managed as VRM Class IV areas contain a high degree of naturally contrasting elements that create scenic landscapes. Oil, gas, and CBNG development in these areas would introduce contrasting elements of form, line, color, and texture, all of which would change the natural

settings to an industrial setting. However, visual mitigation in the form of BMPs, mitigation, and conditions of approval would increase the compatibility of oil and gas development in VRM Class II, III and IV areas.

Impacts to visual resources from the use of flaring or venting natural gas from producing oil or gas wells would be minimal. Flaring or venting generally occurs on a temporary basis within a producing oil or gas location. Due to the temporary nature of flaring or venting those visual resource impacts would be associated with those described above from oil and gas development.

Hydraulic fracturing for conventional oil recovery is associated with existing oil development disturbance and typically short-term. Minor additional visual impacts would occur on the constructed oil locations or access roads and be temporary in nature since this recovery method is used to complete a new well or during workover operations. No long-term visual impacts as a result of hydraulic fracturing are expected.

New recreation site developments would follow appropriate VRM class objectives, such as mitigation of resource damage by blending design and construction of new facilities with the existing landscape. The recreation sites would be managed to promote protection of other resource values and visitor experiences, which would result in providing stronger levels of protection for visual resources. Other impacts to visual resources from recreation management would be minimal.

Dispersed recreational use would increase in specific areas and be mitigated through recreation management actions such as limited use, creation of fee areas, or the establishment of developed recreation sites. Permitted surface disturbing activities could impact visual characteristics in other developed recreation sites managed as ERMAs, these impacts would be mitigated through the implementation of BMPs. Impacts to visual resources from recreation management under this alternative would be minimal.
Renewable energy development and authorization would have long-term impacts if approved within VRM Class II objectives because of the high scenic quality in these areas. If approved under less stringent VRM class objectives, these activities would also have surface-disturbing impacts that would eventually decrease the long-term visual aesthetics of the area.

Transportation and travel management would maintain an adequate road network across the planning area. Any development or new construction of the transportation network would alter visual resources by changing the line, color, and texture of the landscape. Closing roads and restricting access to address adverse impacts would enhance the visual settings of the area by removing contrasting linear elements from the natural landscape.

Designated ACECs would protect important resource values and limit major surface-disturbing activities. These actions would preserve and protect visual resources to the extent allowable under the VRM class objectives, with long-term impacts on scenic quality in these areas.

Maintaining wilderness values would result in impacts to visual resources because they would be managed to preserve pristine or relatively undeveloped high-quality scenic landscapes. Managing WSAs as a VRM Class I visual resource would benefit visual resources in the planning area.

ALTERNATIVE A (No Action)

Summary Statement

The majority of the planning area would be located within VRM Class IV areas (1.89 million acres), the MCFO would use VRM Class I designations of 83,000 acres in all WSAs, VRM Class II designations (400,000 acres) primarily along highway and river corridors, and VRM Class III (375,000 acres) areas along county roadways (See Table 4-26 below for approximate VRM Class acres and % of Field Office). Impacts would not change from current VRM objectives.

Alternative A designates more acres in a VRM Class IV management objective than any other alternative. This is mostly due to the fact that current planning does not have an updated visual resource inventory. Alternative A

would subject more of the planning area open to surface disturbing activities, and in the long-term allow moderate to major modifications to occur.

**TABLE 4-26.
TOTAL BLM-ADMINISTERED SURFACE ACRES
FOR VRM CLASS UNDER ALTERNATIVE A**

VRM Class	Approximate BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Class I	83,000	4
Class II	400,000	14
Class III	375,000	14
Class IV	1,890,000	68

Resources

BLM would not manage non-WSA lands with wilderness characteristics for their scenic value. These lands would not be managed to preserve pristine or relatively undeveloped high-quality scenic landscapes to enhance recreational experiences.

Native or nonnative hay or seed harvesting would create a short-term, unnatural appearance on the landscape. Visual impacts would be greatest if the spatial arrangement, vegetation mosaics, and activity's proximity to key observation points drew attention to the treated area. Over the long-term, these actions would contribute to the natural appearance of the landscape, which would subsequently enhance the visual character of the landscape.

Management actions that allowed surface-disturbing activities to treat invasive species infestations would detract from the viewshed on a short-term basis by disrupting the line, color, and form of the natural vegetation in the area. However, in the long-term, surface-disturbing activities authorized by these actions would contribute to the natural appearance of the landscape and enhance the visual character of the landscape by eliminating invasive species. By not identifying priority treatment areas, invasive species would continue to enhance on the landscape possibly making the area appear unnatural which would be an adverse impact. Under this alternative, fire and fuels management actions would allow the use of wildfire or prescribed fire; biomass removal; and mechanical, chemical, and biological treatments for fuels reduction. These actions would also be used to meet other multi-resource objectives. When needed, rehabilitation and restoration efforts specific to a fire event would be implemented to protect and sustain ecosystems. Fire suppression and fuel treatments in VRM Class I and II areas would detract from the existing visual elements of form, line, color, and texture. Depending on spatial arrangement, vegetation mosaics, and the activity's proximity to key observation points, impacts from these management actions would typically be short-term. Visual impacts from dead, standing, and down woody material caused by wildfire or prescribed burns would be short-term in duration and depend on factors such as the intensity and extent of a given burn, the rate of decay of the dead material, and the size and density of vegetation burned. In the long-term, fuel treatments would improve visual resource qualities by eliminating decadent stands and rejuvenating vegetation.

Resource Uses

Forest management actions would impact visual resources in areas in which wood product sales were allowed. Although some of this product removal would occur in VRM Class II areas, mitigation measures would be used for site-specific projects (including locating wood product sales in areas inconspicuous from key observation points), which would keep visual impacts in this area limited to the short-term. Although forest health restoration projects that improved forest resiliency would impact VRM in the short-term, the benefits of implementation (such as improving forest health) would contribute to the natural viewshed of the VRM class in the long-term. Short-term in duration, salvage of dead and dying timber would improve visual

resource qualities over the long-term by eliminating decadent stands and rejuvenating vegetation. Cottonwood harvest, when used to eliminate disease or insect infestations that threaten other stands, would improve visual qualities by preventing the spread of disease; however, harvest would impact the visual integrity on a short-term basis.

Allowing surface-disturbing or disruptive activities in support of livestock grazing such as fencing of new spring developments, or installation of troughs or tanks in riparian and wetland areas would change the viewshed of the landscape by altering its natural state. Mitigation would be used to reduce the visual impacts and prevent visual degradation of the existing landscape. Properly mitigated activities would result in minor changes to the landscape and avoid attracting the attention of the casual observer.

Surface disturbances associated with the construction of oil and gas facilities, ROWs for pipelines, transmission, communication and utility lines, roads and other developments (including renewable energy) would impact visual resources by introducing contrasting visual elements that alter the character of the landscape. These disturbances are expected to impact visual resources in VRM Class II, III, and IV areas. Development would impact visual resources by altering the typical VRM Class visual settings and creating elements that contrast with existing settings. Surface disturbance and development would introduce contrasting elements of form, line, color, and texture to the surrounding landscape, which would impact the scenic qualities and alter the landscape's existing natural setting. Depending on the characteristics and number of developments, the impacts could create a large footprint not only in the local affected areas but on the landscape setting as well.

VRM Class III and IV areas allow moderate to high levels of change to the characteristics of the landscape, most development is expected to occur in these areas. However, if properly mitigated with BMPs, mitigation, and reclamation, some development would be compatible with VRM Class II management objectives (see the *Reclamation Appendix*). Development in VRM Class III and IV areas would create long-term but allowable (within the objectives) visual impacts. Surface disturbance and development would impact visual resources if activities within VRM Class IV objective areas dominated the landscape, overwhelmed casual observers, and deterred future visits. In a VRM Class IV objective area, every attempt would be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic elements of line, color, and form.

Nonfederal lands acquired in visually sensitive areas, such as WSAs, would help protect the visual settings in these areas. Areas to be avoided would include VRM Class I areas, which would preserve the visual character of these areas.

Under Alternative A, surface disturbing and development activities are limited on approximately 120,000 acres (4% of the Field Office), excluding these types of activities.

Travel Management and OHV management actions under this alternative would allow motorized use on existing roads and trails, unless otherwise designated in Open OHV areas. Open areas would allow contrasting linear features, which would introduce elements that drew the attention of the casual observer from the natural landscape. However, because SRMAs would consider existing resources to avoid conflicts and unnecessary impacts, impacts to visual resources would be limited within these Open areas. Limited OHV use on existing roads and trails would protect visual resources from linear intrusions caused by route proliferation.

Special Designations

ACEC designations under Alternative A would protect scenic resources for the Hell Creek ACEC (12,213 acres VRM Class II and 7,160) which is more than Alternative C, D or E. The Hoe ACEC, Powder River Depot ACEC, Seline ACEC, Battle Butte Battlefield ACEC, Reynolds Battlefield ACEC, and Fingers Butte ACEC would also protect visual resources under a majority of VRM Class II management objective which would benefit and enhance visual resources within the boundary of these areas.

ALTERNATIVE B

Summary Statement

Alternative B has more VRM Class I and II management acres (126,000 and 573,000 acres) than Alternative A, C, D or E which would be more protective of the visual and scenic qualities within the planning area. Alternative B has the least amount of VRM Class IV management acres (1.4 million acres) than any other alternative which would allow the least amount of moderate to major surface disturbing modifications to the characteristic landscape within the planning area, compared to other alternatives. (See Table 4-27 below for approximate VRM Class acres and % of Field Office).

TABLE 4-27.
TOTAL BLM-ADMINISTERED SURFACE ACRES
FOR VRM CLASS UNDER ALTERNATIVE B

VRM Class	Approximate BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Class I	126,000	5
Class II	573,000	20
Class III	631,000	23
Class IV	1,432,000	52

Resources

Managing non-WSA lands with wilderness characteristics on 28,841 acres as a VRM Class I would result in the visual resources being preserved as pristine or relatively undeveloped high-quality scenic landscapes. No surface disturbing activities would occur in these areas, unless they improved the wilderness characteristics and visual resources. Managing non-WSA lands as a VRM Class I visual resource would benefit visual resources in the planning area.

Alternative B greatly limited the extent of surface-disturbing activities on air, soil and water resources. This alternative would prevent the degradation of the viewshed and improve visual qualities on the landscape by preventing alteration of the natural appearance of the landscape.

Native or nonnative hay or seed harvesting would not occur, not allowing impacts to the visual resource. Priority treatment areas for invasive species treatments under this alternative would prevent the degradation of the viewshed and improve visual qualities on the landscape by preventing alteration of the natural appearance of the landscape as these areas were identified and treated. However, not treating invasive species would, in the long-term, would detract from the existing scenic character of the landscape.

Fire suppression within VRM Class I and II areas would detract from the existing visual elements of form, line, color, and texture. Impacts would typically be short-term and depend on the spatial arrangement, vegetation mosaics, and activity's proximity to key observation points. When needed, rehabilitation and restoration efforts specific to a fire event would be implemented to protect and sustain ecosystems. Visual impacts from dead, standing, and down woody material that occurred as a result of wildfire or prescribed burns would be short-term in duration and depend on factors such as the intensity and extent of a given burn, the rate of decay of the dead material, and the size and density of vegetation burned. In the long-term, fuel treatments would improve visual resource qualities by eliminating decadent stands and rejuvenating vegetation.

Resource Uses

While not allowing wood product sales would benefit visual impacts in the short-term, not using this action as a tool to improve forest health would, in the long-term, detract from the visual landscape by increasing the possibility of increased visibility of disease-destroyed stands or dying vegetation.

In the Powder River Depot, Calypso, and Lewis and Clark SRMAs, resource activities would maintain or improve visual characteristics and mitigate resource damage. Withdrawing locatable minerals and implementing an NSO stipulation for oil and gas leasing and development in these SRMAs would further protect the visual integrity of the sites. Proposed SRMAs would benefit visual resources by intensively managing any surface-disturbing activity that modified the visual setting through project redesign and impact mitigation. NSO stipulations for oil and gas leasing and development would preserve the visual quality of the recreational settings. Impacts to visual resources from recreation management actions under this alternative would be minimal.

Surface disturbing and development activities, although minimal, associated with the livestock grazing improvements or construction of oil and gas facilities, ROWs for pipelines, transmission, communication and utility lines, roads and other developments (including renewable energy) would have similar impacts as described in Alternative A. Alternative B greatly limits the surface disturbing activities, with approximately 2.2 million acres (80% of the Field Office) excluding these types of activities. This alternative would retain the quality of visual resources, which is the most beneficial to visual resources of any alternative.

Unless otherwise designated in Open areas, Travel Management and OHV management actions under this alternative would allow motorized use on existing roads and trails. There would not be any open areas for 0 acres which would benefit any visual intrusions from contrasting linear features, which would introduce elements that drew the attention of the casual observer from the natural landscape. Limited OHV use on existing roads and trails would protect visual resources from linear intrusions caused by route proliferation.

Special Designations

ACECs would be managed according to VRM Class II management objectives which would benefit and enhance visual resources and is more beneficial than Alternative A.

ALTERNATIVE C

Summary Statement

Alternative C allows for VRM Class II management acres of approximately 405,000; VRM Class III management acres of nearly 700,000 and VRM Class IV management acres at 1.57 million acres (See Table 4-28 below for approximate VRM Class acres and % of Field Office). This acreage closer resembles what was found in the visual resource inventory and takes into account the scenic values, distance zones and sensitivity level.

**TABLE 4-28.
TOTAL BLM-ADMINISTERED SURFACE ACRES
FOR VRM CLASS UNDER ALTERNATIVE C**

VRM Class	Approximate BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Class I	83,000	4
Class II	405,000	15
Class III	695,000	25
Class IV	1,565,000	56

Resources

Managing non-WSA lands with wilderness characteristics on 5,236 acres as a VRM Class II would result in the visual resources being managed as relatively undeveloped, high-quality scenic landscapes. Surface disturbing activities would occur only if compatible with the retention or enhancement of the area's natural values, including the wilderness characteristics and visual resources. This alternative is more restrictive than Alternative A, but less than Alternative B.

Impacts from Native or nonnative hay or seed harvesting actions would be similar to those described under Alternative A.

Limiting the extent of surface-disturbing activities for soil and water resources, under this alternative would prevent the degradation of the viewshed and improve visual qualities on the landscape by preventing alteration of the natural appearance of the landscape.

Impacts from surface-disturbing activities to treat invasive species infestations would be similar to those described under Alternative A.

Using Early Detection Rapid Response to designate priority treatment areas would contribute to a natural appearance that enhanced the visual character of the landscape.

Impacts from fire and fuels management would be similar to those described under Alternative A.

Resource Uses

Management actions that allowed forestland management for a diversity of forest product production, wood product sales, sawtimber sales, and cottonwood harvest would detract from the existing visual elements of form, line, color, and texture. Impacts would typically be short-term and depend on the spatial arrangement, vegetation mosaics created, and the activity's proximity to key observation points. However, the benefits of implementation (such as improving forest health) would contribute to the natural viewshed of the VRM class in the long-term.

In the Powder River, Calypso, and Lewis and Clark SRMAs, resource activities would maintain or improve visual characteristics and mitigate resource damage. Management actions in proposed SRMAs would benefit visual resources by requiring avoidance for ROWs and NSO stipulations for oil and gas leasing and development, which would be beneficial to the visual setting.

Surface disturbing and development activities associated with the livestock grazing improvements or construction of oil and gas facilities, ROWs for pipelines, transmission, communication and utility lines, roads and other developments (including renewable energy) would have similar impacts as described in Alternative A. Alternative C limits the surface disturbing activities, with approximately 765,000 acres (28% of the Field Office) excluding these types of activities.

Travel Management and OHV management actions under this alternative would allow motorized use on existing roads and trails unless otherwise designated in Open OHV areas. Open areas on approximately 640 acres would allow contrasting linear features, which would introduce elements that drew the attention of the casual observer from the natural landscape. However, because the location of these Open areas would consider existing resources to avoid conflicts and unnecessary impacts, impacts to visual resources would be limited within these Open areas. Limited OHV use on existing roads and trails would protect visual resources from linear intrusions caused by route proliferation. Closing approximately 550 acres would protect visual resources from linear intrusions and result in the long-term enhancement of visual resources. Allowing one-time big game retrieval for those with a Montana permit to hunt from the vehicle would create linear features that contrasted with the existing visual elements of the landscapes, attracted the attention of the casual observer, and detracted from the view.

Special Designations

ACEC VRM Class management objectives would remain similar to Alternative A. For the few that changed to a VRM Class II management objective, this would benefit and enhance visual resources and is more beneficial than Alternative A.

ALTERNATIVE D

Summary Statement

Alternative D has the least amount of VRM Class II acres, the most VRM Class III acres and approximately 1.56 million acres of VRM Class IV acres (See Table 4-29 below for approximate VRM Class acres and % of Field Office). Alternative D would have the least protections on surface disturbing projects since it has the least amount of VRM Class II acres, compared to other alternatives.

**TABLE 4-29.
TOTAL BLM-ADMINISTERED SURFACE ACRES
FOR VRM CLASS UNDER ALTERNATIVE D**

VRM Class	Approximate BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Class I	83,000	4
Class II	382,000	14
Class III	726,000	26
Class IV	1,557,000	56

Resources

Impacts from managing non-WSA lands with wilderness characteristics would be similar to those described under Alternative A.

Impacts from limiting the extent of surface-disturbing activities, for soil and water resources would be similar to those described under Alternative C.

Impacts from Native or nonnative hay or seed harvesting actions would be similar to those described under Alternative A.

Limiting the extent of surface-disturbing activities for soil and water resources, under this alternative would prevent the degradation of the viewshed and improve visual qualities on the landscape by preventing alteration of the natural appearance of the landscape.

Impacts from surface-disturbing activities to treat invasive species infestations would be similar to those described under Alternative A.

Impacts from fire and fuels management would be similar to those described under Alternative A.

Resource Uses

Impacts from forestland management would be similar to those described under Alternative C.

Travel Management and OHV management actions under this alternative would allow motorized use on existing roads and trails unless otherwise designated in Open OHV areas. Open areas on approximately 2,000 acres would allow contrasting linear features, which would introduce elements that drew the attention of the

casual observer from the natural landscape. However, because the location of these Open areas would consider existing resources to avoid conflicts and unnecessary impacts, impacts to visual resources would be limited within these Open areas. Limited OHV use on existing roads and trails would protect visual resources from linear intrusions caused by route proliferation. Allowing one-time big game retrieval would create linear features that contrasted with the existing visual elements of the landscapes, attracted the attention of the casual observer, and detracted from the view.

Surface disturbing and development activities associated with the livestock grazing improvements or construction of oil and gas facilities, ROWs for pipelines, transmission, communication and utility lines, roads and other developments (including renewable energy) would have similar impacts as described in Alternative A. Alternative D limits the surface disturbing activities, with approximately 104,000 acres (3.7% of the Field Office) excluding these types of activities.

Special Designations

ACECs would not be managed at a VRM II management objective. The visual scenic value would be reduced which would adversely impact the visual integrity of the area within these boundaries.

ALTERNATIVE E (Proposed)

Summary Statement

Alternative E is similar to Alternative C (See Table 4-30 below for approximate VRM Class acres and % of Field Office).

Program management under this alternative would protect important visual resources as identified in the inventory and function to support landscape level protection for resources as it closely follows the VRI inventory acres. This alternative would beneficially impact visual resources because it would allow areas inventoried at a lower quality to be afforded the protections of a higher VRM Class. All key visual features would be managed as VRM Class I or II. Therefore, this alternative would protect more visual landscapes than Alternative A, and would provide improved protection of key visual features in the planning area.

**TABLE 4-30.
TOTAL BLM-ADMINISTERED SURFACE ACRES
FOR VRM CLASS UNDER ALTERNATIVE E**

VRM Class	Approximate BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Class I	83,000	4
Class II	400,000	14
Class III	695,000	25
Class IV	1,570,000	57

Resources

Impacts from managing non-WSA lands with wilderness characteristics would be similar to those described under Alternative C.

Impacts from limiting the extent of surface-disturbing activities, for soil and water resources would be similar to those described under Alternative C.

Impacts from Native or nonnative hay or seed harvesting actions would be similar to those described under Alternative C.

Limiting the extent of surface-disturbing activities for soil and water resources, under this alternative would prevent the degradation of the viewshed and improve visual qualities on the landscape by preventing alteration of the natural appearance of the landscape.
Impacts from surface-disturbing activities to treat invasive species infestations would be similar to those described under Alternative A.

Impacts from fire and fuels management would be similar to those described under Alternative A.

Resource Uses

Impacts from forestland management would be similar to those described under Alternative C.

In the Howrey Island, Matthews, Dean S. Reservoir, Pumpkin Creek Ranch and Recreation Area, Glendive Short Pine OHV Area, Strawberry Hill, Moorhead Recreation Area, Calypso, and Lewis and Clark SRMAs, resource activities would maintain or improve visual characteristics and mitigate resource damage. Management actions in proposed SRMAs would benefit visual resources by requiring avoidance for ROWs and requiring NSO stipulations for oil and gas leasing and development, which would require modification of the visual setting and projects and mitigation of impacts. Impacts to visual resources from recreation management actions would be minimal.

There would not be any Open OHV areas which would not show contrasting linear features introducing elements that drew the attention of the casual observer from the natural landscape. Limited OHV use on existing roads and trails would protect visual resources from linear intrusions caused by route proliferation. Closing approximately 2,800 acres would protect visual resources from linear intrusions and result in the long-term enhancement of visual resources.

Surface disturbing and development activities associated with the livestock grazing improvements or construction of oil and gas facilities, ROWs for pipelines, transmission, communication and utility lines, roads and other developments (including renewable energy) would have similar impacts as described in Alternative A. Alternative E limits the surface disturbing activities, with approximately 83,000 acres (3.5% of the Field Office) excluding these types of activities.

Special Designations

Designated ACECs would protect important resource values and limit major surface-disturbing activities. These actions would preserve and protect visual resources to the extent allowable under the VRM class objectives, with long-term impacts on scenic quality in these areas and within these boundaries, especially those ACECs that have a designation of VRM Class II.

CUMULATIVE IMPACTS

VRM has been affected by past land use, oil and gas development, range improvement projects, communication sites, ROWs, and current management actions. Prior to NEPA of 1969 and the Federal Land and Policy Management Act (FLPMA) of 1976, the quality of scenic values was not a major issue; subsequently, land managers and private landowners did not often consider management of visual resources. Railroad and highway construction and other surface-disturbing activities degraded scenic landscape values through the creation of visual intrusions on the historic Great Plains landscape of public, private, and state lands.

As human populations increase and expand in the future, so would the impacts of the infrastructure needed to support those populations. This infrastructure would continue to create visual intrusions that would impact the scenic quality of the natural landscape.

Other future actions that affected visual resources would include oil and gas development, wind energy projects, power and pipeline projects, and communication towers. In combination with identical or similar activities on state or private land, oil and gas development, wind energy, and other surface-disturbing activities would result in cumulative visual impacts that would degrade the scenic quality of landscapes through associated roads and

facilities and barren ground (particularly in areas of checkerboard and other intermixed land ownership patterns). These impacts would be caused primarily by surface disturbance in combination with other activities on federal and nonfederal lands. Some developments constructed on lands outside federal jurisdiction would alter the surrounding landscape to the point of exceeding prescribed VRM objectives. This incremental damage and loss of visual integrity would result in a landscape altered from a natural setting to an industrial setting, which would overwhelm the casual observer or recreationist and impact their experiences on BLM-administered land.

Recreationists depend on the visual setting in which they recreate to enhance their outdoor experience. A decrease in the visual viewshed could be caused by changes in the natural resource base, which could include higher temperatures that create a drought situation or dull color in the landscape, forest fires creating a black or stark landscape, low water levels or dry reservoirs or streams, or reduced air quality that degrades visibility. Vegetation changes could alter the landscape and its appearance to the recreationist or public land user. The extent of the potential impacts to the visual landscape would be highly dependent on the type and level of climate change that occurs.

All of the alternatives (A through E) would contribute to the anticipated cumulative impacts.

LANDS WITH WILDERNESS CHARACTERISTICS

SUMMARY OF IMPACTS

This section identifies the potential impacts to wilderness characteristics caused by implementing proposed management actions in the RMP. Impacts to wilderness characteristics are described in terms of how certain actions affect the wilderness qualities of naturalness, undeveloped conditions, opportunities for solitude or primitive and unconfined type of recreation, or unique or supplemental qualities of a given area, such as significant cultural resources. Alternative B would prioritize the protection of lands with wilderness characteristics the most out of the five alternatives, as it allocates the highest amount of BLM administered lands, 28,841 acres, to be managed as non-WSA lands with wilderness character to protect these wilderness values. Alternatives A and D do not prioritize the protection of lands with wilderness characteristics over other resources uses. Alternatives E and C propose to protect wilderness characteristics as a priority over other multiple uses on 5,236 acres of BLM-administered-lands and emphasize the other resource values on 23,605 acres of BLM-administered lands with wilderness characteristics while providing management restrictions to reduce the impacts to the wilderness characteristics.

ASSUMPTIONS AND METHODOLOGY

This section focuses on analyzing potential impacts to the 28,841 acres in the planning area found to have wilderness characteristics, as discussed in Chapter 2. The following indicators are used in this analysis of lands with wilderness characteristics:

- Naturalness ~ the degree to which an area generally appears to have been affected primarily by the forces of nature with the imprint of people's work substantially unnoticeable. It is not synonymous with natural integrity.
- Solitude~ the state of being alone or remote from others; isolation. A lonely or secluded place.
- Primitive and unconfined recreation~ non-motorized, non-mechanized (except as provided by law), and undeveloped types of recreational activities.

Assumptions used in this impact analysis include the following:

- Limiting and/or closing the area to motorized vehicles will increase the protection of solitude and primitive and unconfined recreation.
- Managing areas as a VRM Class II visual resource will increase the protection of naturalness and primitive/unconfined recreation. Managing areas at a lower VRM class will result in impacts to naturalness and primitive/unconfined recreation.

- Designating an area as non-WSA lands with wilderness characteristics will benefit naturalness and primitive/unconfined recreation.
- ACEC management will benefit lands with wilderness characteristics because often, management prescriptions for ACECs associated with relevant and important values (e.g., scenic, wildlife, and geologic) benefit naturalness and solitude and primitive/unconfined recreation.
- This analysis only considers present conditions when considering lands with wilderness characteristics and not the potential for other areas to become lands with wilderness characteristics through restoration or other changes in current conditions.
- In this document, the BLM may refer to lands with wilderness characteristics managed to protect wilderness values as "non-WSA lands" to distinguish management of these lands from management of WSAs.

IMPACTS COMMON TO ALL ALTERNATIVES

Fish and wildlife protective management actions put in place for all resource and resource use programs which use guidelines in the *Mitigation Measures and Conservation Actions Appendix* is not expected to adversely impact wilderness characteristics.

Forestry and/or woodland activity that removed dead or live trees would have an impact if naturalness and visual integrity were not taken into consideration.

Fire suppression activities would be expected under all alternatives. Impacts from the use of mechanical equipment for construction of firelines, safety zones, and other activities would be expected to degrade naturalness in the short-term. Rehabilitation efforts would mitigate this in the long-term.

Impacts to primitive recreation would also be expected from cattle congregation in recreation use areas, which could create conflict between recreation users and cattle.

Achieving or maintaining Standards for Rangeland Health would benefit wilderness characteristics by maintaining and enhancing natural environments.
Removing unnatural features and rehabilitating any human disturbances already within the area would further enhance the area for naturalness. Grazing use is not expected to adversely impact wilderness characteristics.

Developments and surface disturbance from the developments would affect wilderness characteristics to varying degrees, depending on the type of disturbance, amount, duration, location, and success of any reclamation efforts.

Future travel management planning proposed under all of the action alternatives would use proactive steps to inventory, designate, and maintain a sustainable transportation system. Any existing roads/trails where adverse effects are occurring would be closed which would further enhance the naturalness of a lands with wilderness characteristics area as well as increase solitude and primitive/unconfined recreation.

ALTERNATIVE A (No Action)

Summary Statement

Current management does not have any lands with wilderness characteristics. So, under Alternative A, no lands with wilderness characteristics would be managed to preserve and enhance the apparent naturalness and the opportunities for solitude and primitive and unconfined recreation. The alternative does not prescribe management actions to enhance or maintain the wilderness characteristics of the area. This management would result in impacts to wilderness characteristics from other programs because mitigation actions and proactive management will focus on enhancing the area under other resource actions. These impacts are offset by the fact that what may benefit one resource may also benefit wilderness characteristics.

Resources

This alternative manages the area according to Class II VRM on 28,841 acres. This would reduce the probability of visual intrusions and evidence of human presence in the area, enhancing wilderness characteristics.

There would be no priority treatment areas for invasive species under Alternative A which could allow an unnatural setting to gain control within lands with wilderness characteristics.

Resource Uses

Authorized uses associated with mineral and energy resource development and realty actions would be allowed in most of these areas (including coal, mineral materials and locatable minerals mining, oil and gas development, rights-of-way and land use leasing). These areas would be vulnerable to development. Resource uses could result in increased surface disturbing activities such as visual intrusions, unnatural sounds, and evidence of humans. This alternative does not limit resource use with the potential for adverse impacts to wilderness values.

This alternative will continue to allow motorized vehicles in the area along existing roads and trails. Future travel management decisions would not focus on wilderness characteristics, as there would not be any areas so designated, so it is assumed that this decision would moderately benefit naturalness, but would not benefit solitude and primitive/unconfined recreation.

Managing forestlands for the enhancement of other resources would cause long-term impacts by improving forest health that enhanced wilderness values. Allowing wood product sales for post and poles, Christmas trees, and firewood within specific areas would result in adverse impacts to these values.

Livestock grazing systems and range improvements would be implemented to enhance wildlife, watershed, and riparian values. These systems and improvements would enhance the wilderness values by improving water quality and wildlife habitat, as long as there is no evidence of human intrusion. Range improvements that create visual intrusions or evidence of humans decrease the naturalness, solitude, and primitive/unconfined recreation in the area. Livestock management actions designed to maintain or improve vegetation conditions would enhance these values.

ALTERNATIVE B

Summary Statement

Under Alternative B, approximately 28,841 acres would be managed to preserve and enhance the apparent naturalness and the opportunities for solitude or primitive and unconfined recreation (wilderness characteristics). These wilderness values would be managed on 5,236 acres at Devils Creek; 5,309 acres at Wrangler; 5,302 acres at Rough; 8,184 acres on Ridge; and 4,809 acres on Whitetail. By managing the area as non-WSA land with wilderness characteristics, management actions will sustain and enhance the wilderness characteristics of the areas. Program management under this alternative closes the areas to motorized vehicles and manages the area as VRM Class I. The potential for impacts to wilderness characteristics would be reduced more under Alternative B than any other alternative because the alternative projects the lowest acreage of surface disturbance among the alternatives.

Resources

Alternative B air, soil, water and wildlife management beneficially impact the non-WSA land with wilderness characteristic areas by limiting surface disturbance and intrusion of human presence.

Managing VRM to meet VRM Class I objectives on 28,841 acres would allow very minor changes to the landscape which would remain basically unchanged. Retaining the natural setting would benefit opportunities for primitive recreation or solitude by offering escape from the sights and sounds of civilization. Compared to

Alternative A, this management would reduce the probability of visual intrusions and evidence of human presence in the area, and would enhance wilderness characteristics over a larger area.

Priority treatment areas for invasive species would protect the integrity of wilderness characteristics from disturbances caused by invasive species and assist in protecting wilderness values.

Use of wildfire (unplanned ignitions) to meet multiple objectives, when appropriate, would allow wildfire to play its natural role in the planning area, displacing some recreationists. However long-term impacts would enhance wilderness characteristics. Prescribed fire could occur more frequently on lands with wilderness characteristics, which would potentially alter the recreation experiences through smoke and poor air quality. These impacts would be temporary and would potentially be mitigated or minimized with respect to timing, location, and methods used. Reducing the potential for future large-scale wildfires would benefit the wilderness values over the long-term.

Resource Uses

Eliminating management of forestlands for forest products would reduce forest health. Improved forest health would benefit wilderness values and influence overall recreational opportunities. Declining forest health would impact visual values and settings.

Impacts from livestock grazing management actions would be similar to those described under Alternative A. However range improvements would have to be designed to enhance the wilderness characteristics of the area.

Due to the level of resource restrictions on development/disturbance, the overall impacts are much less than those of Alternative A. Alternative B mineral and realty management impacts the lands with wilderness characteristics areas by limiting surface disturbance and visual/human intrusions. These actions would eliminate physical disturbance and visual intrusions to the area, thereby protecting wilderness values and characteristics. This alternative also closes the area to motorized vehicle use, which would enhance the wilderness values and characteristics.

ALTERNATIVE C

Summary Statement

Management under Alternative C proposes 5,236 acres managed as lands with wilderness characteristics, which is Devils Creek in the northern portion of the MCFO. Approximately 23,605 acres of BLM-administered lands identified as having wilderness characteristics would not be emphasized for priority over other resources. Protections for other resources (e.g. VRM, greater sage grouse, sensitive soils, crucial big game winter range, etc.) would reduce potential impact the wilderness characteristics for the 23,605 acres not managed as such under this alternative.

Resources

Impacts to surface-disturbing activities on air, soils, water and wildlife are similar to those of Alternative B.

Wildfire and fuels management impacts to lands with wilderness characteristics are the same as Alternative B.

VRM would be managed as a Class II VRM management objective which would limit disturbance and increase the protection of naturalness and visual integrity of the area. Alternative C for air, soil, water and wildlife is less protective than Alternative A and B and thus has fewer beneficial impacts to wilderness characteristics. These resources are managed with standard stipulations which would allow more surface disturbance, thus reducing the wilderness characteristics of the area.

Using Early Detection Rapid Response for invasive species control would, over the long-term, improve

vegetation cover and soil stability protecting the physical integrity, which would enhance wilderness values.

Resource Uses

Surface-disturbing activities would be allowed if compatible with the retention or enhancement of the area's natural value. The BLM would apply management (i.e., mitigation) to preserve these characteristics under this alternative. Proposed disturbance activities would have to be closely mitigated and monitored to ensure that the current level of wilderness characteristics was protected and maintained.

Managing forestlands for a diversity of forest product production and resource enhancement would have long-term impacts by providing for improvements in forest health. Allowing wood product sales for post and poles, Christmas trees, and firewood within specific areas (in support of forest health and while meeting management objectives) would only occur if compatible with the retention or enhancement of the area's wilderness values.

ALTERNATIVE D

Summary Statement

Alternative D provides for the management of other multiple uses over protecting lands with wilderness characteristics. The alternative does not prescribe management actions to enhance or maintain the wilderness characteristics of the area. This management would result in impacts to wilderness characteristics from other programs because mitigation actions and proactive management will focus on enhancing the area for other resource uses.

Resources

Impacts to surface-disturbing activities on air, soils, water and wildlife are similar to those of Alternative B.

This alternative manages the area according to Class II VRM on 28,841 acres. This would reduce the probability of visual intrusions and evidence of human presence in the area, enhancing wilderness characteristics.

Allowing priority treatment areas for invasive species and surface-disturbing activities such as mechanical treatment to occur for invasive species control would, over the long-term, improve vegetation cover and soil stability protecting the physical integrity, which would enhance the visual integrity of the area. Wildfire and fuels management impacts are the same as Alternative B.

Resource Uses

Impacts from resource uses are the similar to those found in Alternative A.

ALTERNATIVE E (Proposed)

Summary Statement

Management under Alternative E proposes 5,236 acres managed as land with wilderness characteristics, which is Devils Creek in the northern portion of the MCFO. In addition, approximately 23,605 acres identified as having wilderness characteristics would not be emphasized for priority over other resources. Protections for other resources (e.g. VRM, greater sage grouse, sensitive soils, crucial big game winter range, etc.) would reduce potential impact to the wilderness characteristics for the 23,605 acres not managed as such under this alternative. This alternative is similar to Alternative C; however, many of these protections for other resources are at a higher level (e.g., NSO vs. CSU) when compared to Alternative C.

Resources

Alternative E air, soil, water and wildlife management actions beneficially impact lands with wilderness characteristics by limiting surface disturbance and intrusion of human presence. Wildlife management actions protect habitat, such as greater sage-grouse habitat or crucial big game winter range, from surface disturbance and disruptive activities. Impacts to surface-disturbing activities on air, soils, water and wildlife are similar to those of Alternative B.

Managing VRM to meet VRM Class II objectives on 5,236 acres of lands with wilderness characteristics as a priority over other multiple uses and the 23,605 acres of lands with wilderness characteristics not proposed as priority over other resources would allow very minor changes to the landscape; therefore, the landscape would remain basically unchanged. Retaining the natural setting would benefit opportunities for primitive recreation or solitude by offering escape from the sights and sounds of civilization. Compared to Alternative A, this management would reduce the probability of visual intrusions and evidence of human presence in the area.

Impacts for invasive species control are the same as Alternative C.

Wildfire and fuels management impacts to lands with wilderness characteristics are the same as Alternative B.

Resource Uses

Impacts from resource uses the similar to those found in Alternative C. However, the management of oil and gas leasing with an NSO would eliminate physical disturbance and visual intrusions to the area from development, thereby protecting wilderness values and characteristics on the area proposed to be managed as lands with wilderness characteristics

CUMULATIVE IMPACTS

Past and present actions that have affected and would affect wilderness characteristics include mineral exploration and development; livestock grazing; recreational use; vehicle travel; and wildfire and prescribed fire. In general, these actions have cumulative impacts on wilderness characteristics by causing surface disturbance contributing to fragmentation and impacts to naturalness.

Areas that currently meet the wilderness characteristics criteria, but are managed for protection of other resource values, would inadvertently reduce potential impacts to wilderness characteristics. Other areas that are managed for resource development or use could be impacted to the point where they no longer meet the criteria for wilderness characteristics resulting in a net loss of opportunities for solitude or opportunities for primitive and unconfined recreation.

RESOURCE USES

FORESTRY AND WOODLAND PRODUCTS

ASSUMPTIONS AND METHODOLOGY

Based on data from the Landscape Fire and Resource Management Planning Tools Project (LANDFIRE) Vegetation Cover Types, it is estimated that there are approximately 108,000 acres of coniferous forestland on BLM-administered lands in the planning area. However, access issues; equipment operability challenges; merchantability specifications; market conditions; economics; and soils, riparian, visual, cultural, WSA, and wildlife restrictions would prevent the availability of all acres for treatments or commercial harvest. For this analysis, it is assumed that 25 percent of forestland acres (27,000 acres) would be available for the harvest of commercial sawtimber.

For forestry management projects implemented within the authority Healthy Forest Restoration Act, the project level environmental assessments would analyze the old growth or large tree retention.

Based on monitoring evaluations, probable sale quantity (PSQ) values for all alternatives would be adjusted in response to unforeseen events such as wildfires, insect and disease outbreaks, up-to-date inventory information, impacts to forest and woodland resources from changing climate conditions.
The potential for impacts is directly related to PSQ: higher PSQs signify that either a larger area would be treated or the same area would be managed more intensively. Consequently, alternatives with higher PSQs are more likely to impact, directly or indirectly, other resources.

Pre-European settlement forest conditions, characterized by open, park-like ponderosa pine stands and high-frequency, low-intensity fire return intervals, represent a stable and functional set of ecological conditions for healthy forests and woodlands (e.g., the Historic Range of Variability).

Hazardous fuel loadings and increased levels of insect and disease activity would increase the need to manage forests and woodlands throughout the life of the plan.

The implementation of mitigation measures and specialized design features would reduce the impacts to other resources and resource uses (including soils, vegetation, watersheds, fisheries, wildlife habitat, recreation, cultural sites, and visual integrity).

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources, reviews of existing literature, and information provided by other agencies and institutions. The discussion of impacts is based on the best available data. Knowledge of the planning area and professional judgment, based on observation and analysis of conditions and responses in similar areas, are used to infer environmental impacts where data is limited. Acre figures and other numbers used in the analysis are approximate estimates for comparison and analytical purposes only and do not reflect exact measurements or precise calculations.

IMPACTS COMMON TO ALL ALTERNATIVES

Evaluating activities on a case-by-case basis prior to authorization of surface-disturbing activities would impact the location, timing, and type of vegetation management activity. Protection measures for soil stability, compaction, and erosion would impact forest management by restricting or preventing implementation of treatments in areas determined to have sensitive soils, unstable slopes, or steep topography.

Direct and indirect impacts to water, soil, and riparian resources from timber harvest and other forest management activities would be mitigated by following the Montana Streamside Management Zone Law and adhering to *Water Quality BMPs for Montana Forests* (Logan 2001). Measures to protect water quality, soil, and riparian resources would impact the overall cost, timing, and location of transportation and logging systems and reduce or eliminate timber volume availability in some areas.

Vegetation management actions that required consistency with specific plans under all alternatives would alter and increase the total cost of forest management treatments (e.g., season and timing of operations, herbicide application, and monitoring).

Implementing Integrated Weed Management strategies, invasive vegetation species (weed) management prescriptions, and preventative measures (including additional stipulations such as washing equipment, post-project weed inventories, or the treatment of project areas), would decrease weed-seed proliferation throughout the planning area, thus lowering the overall threat of spreading weeds. Although initial application of weed management strategies would increase forest and woodland treatment costs, proactive control of weeds on BLM-administered forestlands would decrease overall potential future costs.

Proactive management of habitat for threatened, endangered, and special status plant, aquatic, and wildlife species would alter the size, scale, and timing of forest and woodland treatments. In some cases, restrictions would prevent any management activities designed to reduce stand density and improve forest and woodland health. Subsequently, some forest and woodland areas in need of forest health restoration and hazardous fuels

reduction projects would not be treated, which would cause further deterioration of vigor and a continued departure from pre-settlement conditions. However, the impacts of these actions would depend on the individual species in need of protection and its specific habitat requirements.

Woody and non-woody vegetation mechanical thinning, biomass removal, and chemical and biological treatments would allow the implementation of hazardous fuels reduction treatments; subsequently, stand density levels, the likelihood of stand-replacing wildfires, and the risk of degradation to or the complete loss of forest and woodland resources would be reduced.

BLM policy prioritizes fire management activities by potential risks to life and property within the planning area. Prioritizing fire treatment areas would result in evaluations of different forest and woodland types with multiple resource goals, which would subsequently promote forest restoration across the landscape. However, some areas would not be a top priority for prescribed fire activities because they were not located near high priority urban interface communities. Consequently, some forested areas would not be treated and subsequently continue to decline in vigor and resilience to disturbances (e.g., wildfire, insects, and disease).

Requiring an assessment of stand conditions and desired future conditions for all proposed forest and woodland management activities would ensure that an accurate inventory and health evaluation was completed for all projects. Obtaining information regarding stocking levels and stand attributes would assist in achieving management objectives to maintain and promote forest stand structures with large trees appropriate to forest types and successional stages and restore forests and woodlands toward a more natural forest condition class consistent with the Historic Range of Variability for each species.

Prioritizing forest health restoration projects that reduced hazardous fuel loadings and improved resiliency to disturbances from wildfires, insects, and diseases (including impacts from climate change) would ensure that forest and woodland areas that deviated most from historical pre-settlement conditions and in serious need of forest management treatments, would be treated first.

Considering wildlife habitat, watershed health, soils stability, local economic opportunities, recreational use, public safety, hazardous fuels, visual integrity, and any other relevant concerns before implementing forest management treatments would ensure that other resource values would be recognized and evaluated before removing live or dead trees.

Avoiding impacts to significant paleontological and cultural resources (in accordance with Sections 106 and 110 of NHPA), would reduce the efficacy of forest and woodland treatments by redesigning or canceling projects. As a result, this action would decrease or eliminate some treatments that improved forest health and the availability of forest products.

Projects in highly visible or heavily used recreation areas would require mitigation measures to reduce the impacts of visual contrasts, which would subsequently decrease or eliminate some treatments that improved forest health and the availability of forest products.

Grazing management actions designed to maintain or improve vegetative conditions would reduce the mortality and growth deformity of seedling and sapling trees caused by livestock foraging and trampling. Localized grazing in dry conifer forest and woodland areas would reduce the biomass and density of understory grasses that otherwise outcompete conifer seedlings and prevent dense tree recruitment; subsequently, this action would contribute to overstocked forests and changes in tree species composition (Belsky and Blumenthal 1997). In areas of heavy grazing, dense conifer encroachment into adjacent non-forest areas would occur.

Managing the BLM’s transportation system to reduce impacts to natural resources from authorized roads and trails would result in redesign, rerouting, closure, or decommissioning of roads that contributed to resource impacts; thereby increasing costs and restricting or eliminating some treatments that would improve forest health and the availability of forest products.

Although management actions that preserved or enhanced wilderness values of the WSAs in the planning area would prohibit removal of forest products, they would permit some management treatments that improved the health of forest and woodland vegetation. Subsequently, these actions would allow tree removal when necessary for insect and disease control or in emergencies involving wildfires or prescribed fires burning outside of designated boundaries.

ALTERNATIVE A (No Action)

Resources

Avoiding mechanical treatments on slopes greater than 15 percent and highly erodible soils, and restricting the use of ground-based harvesting equipment to slopes less than 40 percent would limit or prohibit some forest treatment activities. The impacts of these actions would increase total costs and alter management activities; including the size, scale, type, and timing (e.g., temporary skid and haul road layout, skidding distances, cutting unit design, harvest system requirements, season of operations, mitigation measures, and silvicultural prescriptions) of treatments designed to improve forest health. Prohibiting surface-disturbing activities would reduce the ability to implement the appropriate silvicultural prescription for stand conditions; consequently, forests and woodlands would not be managed for the maintenance or improvement of vigor and structural diversity and subsequently continue to decline in vigor, productivity, and resilience to disturbances (e.g., wildfire, insects, and disease).

Prohibiting surface-disturbing activities within 0.25 miles of sharp-tailed and greater sage-grouse leks would eliminate timber availability and prohibit forest and woodland management activities designed to improve overall forest health in these areas. Forests and woodlands in need of silvicultural treatments would continue to decline in vigor, productivity, and resilience to disturbances (e.g., wildfire, insects, and disease). In addition, forest management projects designed to reduce conifer encroachment and enhance grouse habitat would be limited.

Allowing surface-disturbing activities in areas of invasive species infestations on BLM-administered lands would not restrict project area locations and would not increase the overall cost of forest and woodland management activities.

Requiring a case-by-case review of road crossings and new culvert installations or replacements for adequate fish passage would increase the overall cost of forest and woodland management activities.

Implementing prescribed fire as a management tool in Fire Management Categories B and C would improve forest health by reducing fuels and the likelihood of stand-replacing crown fires. This action would also improve the resiliency and ecological functions of forests and woodlands. Requiring the removal or treatment of pre-commercial and commercial material from forest and woodland areas in Condition class 3 areas prior to prescribed fire activities would ensure that silvicultural treatments designed to meet specific management objectives, trees densities, and phenotypic selection would be met prior to implementation of prescribed fire treatments. Limiting prescribed fire to areas already treated with hand or mechanical treatments would ensure that forest and woodland resources attained or maintained proper stocking levels and retained stand structures that accommodated prescribed fire without extensive resource damage or loss or a high-intensity, stand-replacing event.

Restricting the use of wildfire (unplanned ignitions) to Fire Management Categories C and D would limit the number of acres that benefitted from reductions in stand density and site preparation for re-vegetation and establishment of seedlings.

Resource Uses

Forestland management for areas with 10 percent or more canopy cover and wood product sale management under this alternative would restrict proactive management treatments designed to improve forest health by reducing stand densities and restoring forests and woodlands to pre-European settlement conditions to areas with fire or insect-affected trees. Without proactive forest management treatments, forests and woodlands

would continue to decline in vigor, productivity, and resiliency to disturbances (e.g., wildfire, insects, and disease). As a result, the majority of forest areas would shift toward late successional forests and woodlands and exhibit conditions out of character with the Historic Range of Variability. Forest and woodland areas would be at risk for extensive resource damage or loss due to landscape-level insect outbreaks or high-intensity wildfires. Restricting wood product sales for firewood, post and poles, and Christmas trees to designated areas would reduce the opportunity for these small forest management projects across the planning area. Restricting the harvest of cottonwood trees to those areas threatened by insects or diseases or where human safety was a factor would prevent some treatments designed to restore the health and resiliency of cottonwood stands.

Temporarily closing livestock grazing after prescribed or wildfire for at least 1 growing season would not provide enough time for re-vegetation and seedling establishment in forests and woodlands. Newly established vegetation and seedlings would be subject to extensive damage caused by livestock foraging and trampling, which would result in mortality or growth deformity. Allowing livestock grazing in dry conifer forest and woodland areas would encourage conifer encroachment into adjacent non-forest areas by reducing competition with grasses.

Special Designations

Allowing wood product sales in the Howrey Island ACEC with restrictions would increase the availability of forest products and permit management treatments designed to improve overall forest health and resiliency to disturbances (e.g., wildfire, insects, and disease).

Allowing management of forest and woodland products, biomass, and hazardous fuels in designated ACECs would increase timber volume availability and permit management treatments designed to improve the overall forest health and resiliency of forests and woodlands to disturbances (e.g., wildfire, insects, and disease).

ALTERNATIVE B

Resources

Prohibiting surface-disturbing activities on slopes 25 percent or greater, sensitive soils, and in riparian and wetland areas would eliminate most forest treatment activities and increase the difficulty and expense of accomplishing desired forest health management goals. Prohibiting surface-disturbing activities would reduce the ability to implement the appropriate silvicultural prescription for stand conditions; consequently, forests and woodlands would not be managed for the maintenance or improvement of vigor and structural diversity and subsequently continue to decline in vigor, productivity, and resilience to disturbances (e.g., wildfire, insects, and disease).

Prohibiting surface-disturbing activities in Big Game Crucial Winter Range and in areas of invasive species infestations on BLM-administered lands would restrict project area locations and increase the overall costs of forest and woodland management activities.

Requiring new road construction and replacement of stream-crossing structures for adequate fish passage and habitat protection would increase the overall cost of forest and woodland management activities.

Allowing surface-disturbing activities with specialized design features to maintain the functionality of sharp-tailed and greater sage-grouse nesting habitat and lek sites within 4 miles would restrict or modify, but not preclude, forest and woodland management activities and timber availability in these areas. These actions would increase the expense and difficulty of accomplishing forest and woodland health management goals by limiting or delaying the activities, forcing redesign of treatments, or requiring the implementation of timing buffer mitigation measures.

Prohibiting surface-disturbing or disruptive activities within 0.5 miles of raptor nest sites under this alternative would eliminate timber volume availability and prohibit forest and woodland management

activities designed to improve overall forest health in these areas. Consequently, forests and woodlands in need of silvicultural treatments would continue to decline in vigor, productivity, and resilience to disturbances (e.g., wildfire, insects, and disease).

Prohibiting the use of prescribed fire as a management tool on approximately 2.5 million acres in the planning area would not allow treatments designed to improve forest and woodland health in these areas. Requiring the removal or treatment of pre-commercial and commercial material from forest and woodland areas in Condition class 3 areas prior to prescribed fire activities would ensure that silvicultural treatments designed to meet specific management objectives, trees densities, and phenotypic selection would be met prior to implementation of prescribed fire treatments. Limiting prescribed fire to areas already treated with hand or mechanical treatments would ensure that forest and woodland resources attained or maintained proper stocking levels and retained stand structures that accommodated prescribed fire without extensive resource damage or loss or a high-intensity, stand-replacing event.

Authorizing the use of wildfire (unplanned ignitions) adjacent to the Custer National Forest and Charles M. Russell National Wildlife Refuge when consistent with forest management goals and objectives and where the risks of degradation to or the complete loss of forest and woodland resources were minimal would result in resource benefits that included lower stand density levels and preparation of sites for vegetation and seedling establishment.

Resource Uses

Forestland management and wood product sale management, under which treatments would only be allowed in situations in which trees posed a safety hazard or were affected by insects) would cause the majority of forest areas to shift toward late successional forests and woodlands. Forests and woodlands would continue to depart from characteristic pre-settlement conditions, which would contribute to declines in forest and woodland health, changes in species composition, increases in stand densities and fuel loadings, and increases in the susceptibility of forests and woodlands to insect and disease epidemics. Trees would continue to grow on sites in which they were historically limited by natural disturbances. Competition for resources (e.g., sunlight, water, and nutrients) would increase stress to vegetation across the entire landscape, which would result in declining vigor, productivity, and resiliency to disturbances (e.g., wildfire, insects, and disease). Consequently, forests and woodlands would exhibit conditions out of character with the Historic Range of Variability. Forest and woodland areas would be at risk for extensive resource damage or loss due to landscape-level insect outbreaks or high-intensity wildfires.

Restricting the harvest of cottonwood trees to those areas threatened by insects or diseases or where human safety was a factor would prevent some treatments designed to restore the health and resiliency of cottonwood stands.

Temporarily closing livestock grazing after wildfire, prescribed fire, or non-fire vegetative treatments for at least 2 growing seasons would not provide enough time for re-vegetation and seedling establishment in forests and woodlands. Newly established seedlings would be subject to extensive damage caused by livestock foraging and trampling, which would result in mortality or growth deformity. Allowing livestock grazing in dry conifer forest and woodland areas would encourage conifer encroachment into adjacent non-forest areas by reducing competition with grasses.

Special Designations

Prohibiting wood product sales in the Howrey Island SRMA would decrease the availability of forest products and exclude management treatments designed to improve the overall forest health and resiliency to disturbances (e.g., wildfire, insects, and disease). Allowing forest management treatments that provided for the improvement or maintenance of ecosystem functionality in designated ACECs (as long as the improvements would not damage the values of the ACECs) would increase timber volume availability and permit management treatments designed to improve overall forest health and the resiliency of forests and woodlands to disturbances (e.g., wildfire, insects, and disease).

Placing priority on the management for lands with wilderness characteristics would lead to continuing the present trends of increasing canopy closure; stand density; ladder fuels; and crown and forest fuel loads until there would be a crown-reducing disturbance event such as wildfire or an insect outbreak in these stands. The existing conditions of increasing canopy closure, duff depth, and stand density would remain the same and there would continue to be a lack of pine regeneration, since pine is a shade-intolerant tree and needs bare mineral soil to regenerate. Intermixed shrublands in the area would become smaller in size as ponderosa pine and rocky mountain juniper encroach into these previously unforested areas. Additionally competition for available nutrients and water would continue as the density of the stands continues to increase. Stands of timber within the Wrangler and Rough Lands with Wilderness Characteristic would continue to be at risk from severe wildfire, since these areas are primarily in fire condition class 2 and 3 and within a high lightening activity area.

ALTERNATIVE C

Resources

Avoiding surface-disturbing activities on sensitive soils and slopes greater than 25 percent whenever possible would limit or prohibit some forest treatment activities. Consequently, these actions would increase total costs and alter management activities; including the size, scale, type, and timing (e.g., temporary skid and haul road layout, skidding distances, cutting unit design, harvest system requirements, season of operations, mitigation measures, and silvicultural prescriptions) of treatments designed to improve forest health.

Avoiding surface-disturbing activities in riparian and wetland areas whenever possible would reduce or eliminate timber volume availability in some areas. However, if avoidance were not possible, activities would be subject to restrictions that would ensure water quality, soils, and riparian vegetation would be preserved or enhanced.

Management actions that allowed surface-disturbing activities with specialized design features to maintain the functionality of sharp-tailed (within 2 miles) and greater sage-grouse nesting habitat and lek sites (within 3.1 miles) would restrict or modify, but not preclude, forest and woodland management activities and timber availability in these areas. These actions would subsequently increase the expense and difficulty of accomplishing forest and woodland health management goals by limiting or delaying the activities, forcing redesign of treatments, or requiring the implementation of timing buffer mitigation measures.

Allowing surface-disturbing activities in Big Game Crucial Winter Range and areas of invasive species infestations on BLM-administered lands only with approved mitigation measures in place would restrict project area locations and increase the overall cost of forest and woodland management activities.

Prioritizing invasive species control using Early Detection Rapid Response would focus treatments on areas with new invasive vegetation species (weed) establishment, which would prevent rapid weed spread and landscape-level weed infestations in forests and woodlands and decrease potential future eradication costs. Under this alternative, allowing surface-disturbing or disruptive activities within 0.5 miles of raptor nest sites with specialized design features to minimize disturbance to nest sites would increase the difficulty and expense of accomplishing forest and woodland health management goals by limiting or delaying activities or requiring timing buffer mitigation measures.

Management actions that require new construction or replacement of stream-crossing structures for adequate fish passage and habitat protection would increase the overall cost of forest and woodland management activities.

Implementing prescribed fire as a management tool throughout the planning area would improve forest health by reducing fuels and the likelihood of stand-replacing crown fires, improving the resiliency and ecological functions of forests and woodlands, and preparing sites for vegetation establishment. Evaluating sites in condition class 3 areas to determine if mechanical treatments or pre-commercial or commercial thinning would be necessary to reduce heavy fuel loadings or remove merchantable forest products prior to prescribed fire activities would ensure that forest and woodland resources would attain or maintain proper stocking

levels and retain stand structures that would accommodate prescribed fire without resource damage or a high-intensity, stand-replacing event.

Authorizing the use of wildfire (unplanned ignitions) in the planning area when consistent with forest management goals and objectives and where the risks of degradation to, or the complete loss of, forest and woodland resources would be minimal would result in resource benefits that included lower stand density levels and preparation of sites for vegetation and seedling establishment.

Resource Uses

Under Alternative C, forestlands would be managed for a diversity of forest products, sustainable yields, and the enhancement of forest and woodland resources. PSQs for commercial sawtimber would be established based on site-specific analysis and sale quantities of up to 650 thousand board feet per year (mbf/year) would be authorized. Implementing silvicultural treatments on forest and woodland areas would reduce the density of overstocked stands, which would reduce competitive stress for water, sunlight, and nutrients, and reduce the area's susceptibility to insect attacks, disease, and stand-replacing fire. Lower stand density levels and increased sunlight would promote tree growth and vigor, as well as ponderosa pine and limber pine regeneration. Leaving healthy dominant and co-dominant trees would increase the large tree component of forests and woodlands within the planning area. Trees growing on sites where natural disturbance historically limited their presence would be treated to reflect characteristics of a pre-European settlement landscape. Sales for other forest products including post and poles, firewood, and Christmas trees would be allowed, which would facilitate the opportunity for these small forest management projects across the planning area. Allowing the harvest of cottonwood trees for hazard tree removal and as a tool to restore the health and resiliency of these stands would improve the functionality, vigor, and longevity of cottonwood forests.

Forested vegetation would be affected by both timber and fire management activities, which would subsequently alter the condition class of the treatment area. Management treatments designed to reduce ladder fuels and understory vegetation buildup would lower the condition class of a project area and shift forests and woodlands toward fire return intervals and stand structures characteristic of vigorous pre-settlement conditions consistent with the Historic Range of Variability. After treatment, forests and woodlands would improve in vigor, productivity, and resiliency to disturbances (e.g., wildfire, insects, and disease). The risk for extensive resource damage or loss due to landscape-level insect outbreaks or high-intensity wildfires would be reduced. Insect and disease activity would be at endemic levels and fire activity would more closely resemble its historical natural role.

Under this alternative, forests and woodlands would be managed for the maintenance or improvement of overall vigor, productivity, and structural diversity; to sustain and restore habitat diversity; to actively manage species composition, size, and age class distribution; and to implement treatments on forest areas with a high risk for extensive stand mortality. This action would increase the availability of forest byproducts as a biomass fuel source or for conversion into manufactured wood products.

Closing livestock grazing after wildfire, prescribed fire, or non-fire vegetative treatments until the area attained identified vegetative objectives would reduce the damage to forest vegetation caused by livestock foraging and trampling, which would result in lower levels of seedling mortality and growth deformity. These actions would also facilitate rapid re-vegetation and seedling establishment in forests and woodlands. Longer closures of these areas would increase the likelihood of seedling survival and allow young trees the opportunity to grow tall enough to withstand grazing. Allowing livestock grazing in dry conifer forest and woodland areas would encourage conifer encroachment into adjacent non-forest areas by reducing competition with grasses.

Special Designations

Allowing wood product sales in the Howrey Island ACEC would increase forest products availability and permit management treatments designed to improve the overall forest health and resiliency to disturbances (e.g., wildfire, insects, and disease).

Allowing forest management treatments that provided for the improvement or maintenance of ecosystem functionality in designated ACECs (as long as the improvements would not damage the values of ACECs) would increase timber volume availability and permit management treatments designed to improve overall forest health and the resiliency of forests and woodlands to disturbances (e.g., wildfire, insects, and disease).

ALTERNATIVE D

Resources

Under this alternative, avoiding surface-disturbing activities on sensitive soils and slopes greater than 25 percent whenever possible would limit or prohibit some forest treatment activities. Consequently, these actions would increase total costs and alter management activities; including the size, scale, type, and timing (e.g., temporary skid and haul road layout, skidding distances, cutting unit design, harvest system requirements, season of operations, mitigation measures, and silvicultural prescriptions) of treatments designed to improve forest health.

Avoiding surface-disturbing activities in riparian and wetland areas whenever possible would reduce or eliminate timber volume availability in some areas. However, if avoidance were not possible, activities would be subject to restrictions that ensured that water quality, soils, and riparian vegetation would be preserved or enhanced.

Allowing surface-disturbing activities in Big Game Crucial Winter Range and in areas of invasive species infestation on BLM-administered lands only with approved mitigation measures in place would restrict project area locations and increase the overall cost of forest and woodland management activities.

Requiring a case-by-case review of road crossings and new culvert installations or replacements to ensure adequate fish passage would increase the overall cost of forest and woodland management activities. Allowing surface-disturbing activities with specialized design features to maintain the functionality of sharp-tailed and greater sage-grouse nesting habitat and lek sites within 2 miles would restrict or modify, but not preclude, forest and woodland management activities and timber availability in these areas. These actions would increase the expense and difficulty of accomplishing forest and woodland health management goals by limiting or delaying the activities, forcing redesign of treatments, or requiring the implementation of timing buffer mitigation measures.

Under this alternative, allowing surface-disturbing or disruptive activities within 0.5 miles of raptor nest sites with specialized design features to minimize disturbance to nest sites would limit or delay activities or require buffers with timing mitigation measures, which would increase the difficulty and expense of accomplishing forest and woodland health management goals.

Implementing prescribed fire as a management tool throughout the planning area would improve forest health by reducing fuels and the likelihood of stand-replacing crown fires, improving the resiliency and ecological functions of forests and woodlands, and preparing sites for vegetation establishment. Evaluating sites in condition class 3 areas to determine if mechanical treatments or pre-commercial or commercial thinning were necessary to reduce heavy fuel loadings or remove merchantable forest products prior to prescribed fire activities would ensure that forest and woodland resources would attain or maintain proper stocking levels and retain stand structures that would accommodate prescribed fire without resource damage or a high-intensity, stand-replacing event.

Authorizing the use of wildfire (unplanned ignitions) in the planning area when consistent with forest management goals and objectives and where the risks of degradation to or the complete loss of forest and woodland resources would be minimal would result in resource benefits that included lower stand density levels and preparation of sites for vegetation and seedling establishment.

Resource Uses

Forestlands would be managed for a diversity of forest products, sustainable yields, and the enhancement of forest and woodland resources. PSQs for commercial sawtimber would be established based on site-specific analysis, and sale quantities of up to 1,100 mbf/year would be authorized. Implementing silvicultural treatments on forest and woodland areas would reduce the density of overstocked stands, which would reduce competitive stress for water, sunlight, and nutrients, and reduce the area's susceptibility to insect attacks, disease, and stand-replacing fire. Lower stand density and increased sunlight would promote tree growth and vigor and ponderosa pine and limber pine regeneration. Leaving healthy dominant and co-dominant trees would increase the large tree component of forests and woodlands within the planning area. Trees growing on sites where natural disturbance historically limited their presence would be treated to reflect characteristics of a pre-European settlement landscape. Allowing sales for other forest products (including post and poles, firewood, and Christmas trees) would facilitate opportunities for these small forest management projects across the planning area. Allowing the harvest of cottonwood trees for hazard tree removal and as a tool to restore the health and resiliency of these stands would improve the functionality, vigor, and longevity of cottonwood forests.

Forested vegetation would be affected by both timber and fire management activities, which would alter the condition class of the treatment area. Management treatments designed to reduce ladder fuels and understory vegetation buildup would lower the condition class of a project area and shift forests and woodlands toward fire return intervals and stand structures characteristic of vigorous pre-settlement conditions consistent with the Historic Range of Variability. After treatment, forests and woodlands would improve in vigor, productivity, and resiliency to disturbances (e.g., wildfire, insects, and disease). The risk for extensive resource damage or loss due to landscape-level insect outbreaks or high-intensity wildfires would be reduced. Insect and disease activity would be at endemic levels and fire activity would more closely resemble its historical natural role.

Managing forests and woodlands for the maintenance or improvement of overall vigor, productivity, and structural diversity; to sustain and restore habitat diversity; to actively manage species composition, size, and age class distribution; and to implement treatments on forest areas with a high risk for extensive stand mortality would increase the availability of forest byproducts as a biomass fuel source or for conversion into manufactured wood products.

Closing livestock grazing after wildfire, prescribed fire, or non-fire vegetative treatments until established seed set the next growing season would not provide enough time for re-vegetation and seedling establishment in forests and woodlands. Newly established vegetation and seedlings would be subject to extensive damage caused by livestock foraging and trampling, which would result in mortality or growth deformity. Allowing livestock grazing in dry conifer forest and woodland areas would encourage conifer encroachment into adjacent non-forest areas by reducing competition with grasses.

Special Designations

Allowing wood product sales in the Howrey Island ACEC would increase forest products availability and permit management treatments designed to improve the overall forest health and resiliency to disturbances (e.g. wildfire, insects, and disease).

Allowing management of forest and woodland products, biomass materials, and hazardous fuels in designated ACECs would increase timber volume availability and allow management treatments designed to improve overall forest health and forest and woodland resiliency to disturbances (e.g., wildfire, insects, and disease).

ALTERNATIVE E (Proposed)

Resources

Avoiding surface-disturbing activities on sensitive soils and slopes greater than 25 percent whenever possible would limit or prohibit some forest treatment activities. Consequently, these actions would increase total

costs and alter management activities; including the size, scale, type, and timing (e.g., temporary skid and haul road layout, skidding distances, cutting unit design, harvest system requirements, season of operations, mitigation measures, and silvicultural prescriptions) of treatments designed to improve forest health.

Avoiding surface-disturbing activities within 300 feet of riparian and wetland areas whenever possible would reduce or eliminate timber volume availability in some areas. However, if avoidance were not possible, activities would be subject to restrictions that would ensure water quality, soils, and riparian vegetation would be preserved or enhanced.
Allowing surface-disturbing activities in Big Game Crucial Winter Range and in areas of invasive species infestation on BLM-administered lands only with approved mitigation measures in place would restrict project area locations and increase the overall cost of forest and woodland management activities.

Prioritizing invasive species control using Early Detection Rapid would focus treatments on areas with new weed establishment; which would prevent rapid weed spread and landscape-level infestations in forests and woodlands and decrease potential future eradication costs.

Management actions that require new construction or replacement of stream-crossing structures for adequate fish passage and habitat protection would increase the overall cost of forest and woodland management activities.

Allowing surface-disturbing activities with specialized design features, to maintain sharp-tailed and greater sage-grouse nesting habitat and lek sites within 2 miles would restrict or modify, but not preclude, forest and woodland management activities and timber availability in these areas. These actions would increase the expense and difficulty of accomplishing forest and woodland health management goals by limiting or delaying the activities, forcing redesign of treatments, or requiring the implementation of timing buffer mitigation measures.

Under this alternative, allowing surface-disturbing or disruptive activities within 0.5 miles of raptor nest sites with specialized design features to minimize disturbance to nest sites would limit or delay activities or require buffers with timing mitigation measures, which would increase the difficulty and expense of accomplishing forest and woodland health management goals.

Implementing prescribed fire as a management tool throughout the planning area would improve forest health by reducing fuels and the likelihood of stand-replacing crown fires, improving the resiliency and ecological functions of forests and woodlands, and preparing sites for vegetation establishment. Evaluating sites in condition class 3 areas to determine if mechanical treatments or pre-commercial or commercial thinning were necessary to reduce heavy fuel loadings or remove merchantable forest products prior to prescribed fire activities would ensure that forest and woodland resources would attain or maintain proper stocking levels and retain stand structures that would accommodate prescribed fire without resource damage or a high-intensity, stand-replacing event.

Authorizing the use of wildfire (unplanned ignitions) in the planning area when consistent with forest management goals and objectives and where the risks of degradation to or the complete loss of forest and woodland resources would be minimal would result in resource benefits that included lower stand density levels and preparation of sites for vegetation and seedling establishment.

Resource Uses

Forestlands would be managed for a diversity of forest products, sustainable yields, and the enhancement of forest and woodland resources. PSQs for commercial sawtimber would be established based on site-specific analysis, and sale quantities of up to 1,100 mbf/year would be authorized. Implementing silvicultural treatments on forest and woodland areas would reduce the density of overstocked stands, which would reduce competitive stress for water, sunlight, and nutrients, and reduce the area’s susceptibility to insect attacks, disease, and stand-replacing fire. Lower stand density and increased sunlight would promote tree growth and vigor and ponderosa pine and limber pine regeneration. Leaving healthy dominant and co-dominant trees would increase the large tree component of forests and woodlands within the planning area. Trees growing on

sites where natural disturbance historically limited their presence would be treated to reflect characteristics of a pre-European settlement landscape. Allowing sales for other forest products (including post and poles, firewood, and Christmas trees) would facilitate opportunities for these small forest management projects across the planning area. Allowing the harvest of cottonwood trees for hazard tree removal and as a tool to restore the health and resiliency of these stands would improve the functionality, vigor, and longevity of cottonwood forests.

Forested vegetation would be affected by both timber and fire management activities, which would alter the condition class of the treatment area. Management treatments designed to reduce ladder fuels and understory vegetation buildup would lower the condition class of a project area and shift forests and woodlands toward fire return intervals and stand structures characteristic of vigorous pre-settlement conditions consistent with the Historic Range of Variability. After treatment, forests and woodlands would improve in vigor, productivity, and resiliency to disturbances (e.g., wildfire, insects, and disease). The risk for extensive resource damage or loss due to landscape-level insect outbreaks or high-intensity wildfires would be reduced. Insect and disease activity would be at endemic levels and fire activity would more closely resemble its historical natural role.

Managing forests and woodlands for the maintenance or improvement of overall vigor, productivity, and structural diversity; to sustain and restore habitat diversity; to actively manage species composition, size, and age class distribution; and to implement treatments on forest areas with a high risk for extensive stand mortality would increase the availability of forest byproducts as a biomass fuel source or for conversion into manufactured wood products.

Closing livestock grazing after wildfire, prescribed fire, or non-fire vegetative treatments until the area attained identified vegetative objectives would reduce the damage to forest vegetation caused by livestock foraging and trampling, which would result in lower levels of seedling mortality and growth deformity. These actions would also facilitate rapid re-vegetation and seedling establishment in forests and woodlands. Longer closures of these areas would increase the likelihood of seedling survival and allow young trees the opportunity to grow tall enough to withstand grazing. Allowing livestock grazing in dry conifer forest and woodland areas would encourage conifer encroachment into adjacent non-forest areas by reducing competition with grasses.

Special Designations

Prohibiting wood product sales in the Howrey Island ACEC would decrease forest product availability and exclude management treatments designed to improve the overall forest health and resiliency to disturbances (e.g., wildfire, insects, and disease).

Allowing forest management treatments that provided for the improvement or maintenance of ecosystem functionality in designated ACECs (as long as the improvements would not damage the values of ACECs) would increase timber volume availability and permit management treatments designed to improve overall forest health and the resiliency of forests and woodlands to disturbances (e.g., wildfire, insects, and disease).

CUMULATIVE IMPACTS

Historically, the majority of forested areas in the planning area consisted of open, park-like stands of ponderosa pine and juniper intermixed with hardwood draws. Mature stands were dominated by large ponderosa pine trees with an understory of native bunchgrasses and low shrubs. For at least the last 10,000 years, American Indians supplemented lightning-caused fire with their own fires to encourage foods to grow in the understory (such as berries), to open the forest to attract game and simplify hunting, and to prevent surreptitious attacks by enemies in heavy forest cover (Clark and Sampson 1995). High frequency, low intensity fires kept forests open and removed understory vegetation, down material, and tree regeneration, resulting in irregularly shaped patches and groups of trees varying in size and density across the landscape. Impacts of past actions, natural events, and region-wide decisions (e.g., fire suppression, insect and disease activity, grazing) that affected forests are described in Chapter 3, *Affected Environment*.

In the early 1900s, aggressive fire suppression became the management rule on public lands to protect human lives, property, and forests from the devastating impacts of wildfires. Implementation of fire control strategies dramatically interrupted the historical role of fire in ponderosa pine ecosystems, which resulted in species composition changes and increased stand density levels. Subsequently, vegetative communities shifted toward late successional stage forests and woodlands. Forests and woodlands have declined in overall health, productivity, and functionality, and are therefore less resilient to disturbances (e.g., wildfire, insects, and disease). Overstocked stands experience increased stress due to competition for water, sunlight, and nutrients. These conditions have increased the susceptibility of forested areas to insect attacks, disease, and stand-replacing fires. The virtual exclusion of fire in the more than 100 years since Euro-Americans settled the region has been a major factor in ecosystem changes that today pose an almost-certain risk of high-intensity, stand-replacing wildfire (Clark and Sampson 1995).

Horses, cattle, and sheep have intensively grazed eastern Montana since the mid-1850s (Hansen et al. 2008) and have removed fine grass fuels that historically carried low-intensity fires over large areas annually (Clark and Sampson 1995). Because of both fire suppression and livestock grazing, juniper became established on sites that were previously grass covered and maintained by periodic wildfires (Smeins and Fuhlendorf 1997). Today, trees are growing on sites in which natural disturbance historically limited their presence.

Alternative A (No Action)

Under Alternative A, sales of commercial sawtimber would be restricted to those areas with fire or insect-affected trees; therefore, only a small percentage of forest and woodland acres in need of forest health restoration projects would be treated. Proactive silvicultural treatments designed to improve forest health by reducing stand densities and restoring forests and woodlands to pre-European settlement conditions would be restricted only to areas with fire or insect-affected trees. As a result, forests and woodlands would continue to depart from the Historic Range of Variability, which would contribute to a decline in forest health, species composition changes, increased stand density levels and fuel loadings, and increased susceptibility of these areas to insect and disease epidemics. Competition for resources (e.g., sunlight, water, and nutrients) would increase stress to forest and woodland vegetation across the entire landscape, which would result in declining vigor, productivity, and resiliency to disturbances (e.g., wildfire, insects, disease, and climate change). Consequently, forest and woodland areas would be at risk for extensive resource damage or loss due to landscape-level insect outbreaks or high-intensity wildfires.

Alternative B

Under Alternative B, no sales of special forest products (e.g., firewood, post and poles, Christmas trees) or commercial sawtimber would be allowed (except in situations in which trees posed a safety hazard or were affected by insects). The implementation of proactive silvicultural treatments designed to reduce fuel accumulations and restore stands to desired conditions by improving the overall vigor, productivity, and resiliency of forested vegetation would not be an option under this alternative. As a result, forests and woodlands would continue to depart from the Historic Range of Variability, which would contribute to a decline in forest health, changes in species composition, increased stand densities and fuel loadings, and increased susceptibility of these areas to insect and disease epidemics. Trees would continue to grow on sites in which natural disturbances historically limited their presence. Competition for resources (e.g., sunlight, water, and nutrients) would increase stress to vegetation across the entire landscape, which would result in declining vigor, productivity, and resiliency to disturbances (e.g., wildfire, insects, disease, and climate change). Consequently, forest and woodland areas would be at risk for extensive resource damage or loss due to landscape-level insect outbreaks or high-intensity wildfires.

Alternative C

Alternative C would provide a moderate volume of commercial forest products and contribute to long-term forest health improvement. Implementation of silvicultural treatments in forests and woodlands would reduce the density of overstocked stands, which would subsequently reduce competitive stress for water, sunlight, and nutrients, and reduce the susceptibility of forests and woodlands to insect attacks, disease, and stand-replacing fire. Lower stand density levels and increased sunlight would promote tree growth and ponderosa

pine and limber pine regeneration. Alternative C would contribute to the overall vigor, productivity, and resiliency of forest and woodland vegetation in the planning area and the restoration of conditions characteristic of the Historical Range of Variability.

Alternative D

Alternative D would provide a moderate-high volume of commercial forest products and contribute to long-term improvements in forest health. Implementation of silvicultural treatments in forests and woodlands would reduce the density of overstocked stands, which would subsequently reduce competitive stress for water, light, and nutrients and reduce the susceptibility of forests and woodlands to insect attacks, disease, and stand-replacing fire. Lower stand density levels and increased sunlight would promote tree growth and ponderosa pine and limber pine regeneration. Alternative D would contribute to the overall vigor, productivity, and resiliency of forest and woodland vegetation in the planning area and the restoration of conditions characteristic of the Historical Range of Variability.

Alternative E (Proposed)

Alternative E would provide a moderate-high volume of commercial forest products and contribute to long-term improvements in forest health. Implementation of silvicultural treatments in forests and woodlands would reduce the density of overstocked stands, which would subsequently reduce competitive stress for water, light, and nutrients and reduce the susceptibility of forests and woodlands to insect attacks, disease, and stand-replacing fire. Lower stand density levels and increased sunlight would promote tree growth and ponderosa pine and limber pine regeneration. Alternative E would contribute to the overall vigor, productivity, and resiliency of forest and woodland vegetation in the planning area and the restoration of conditions characteristic of the Historical Range of Variability.

LIVESTOCK GRAZING

Direct impacts to livestock grazing result from management actions that change AUM allocations or restrict livestock grazing. Indirect impacts to livestock grazing, result from management actions that affect rangeland health and productivity, or that result in a change in livestock grazing management on BLM-administered public lands in the planning area.

SUMMARY OF IMPACTS

Alternative B would result in the most AUMs unavailable for grazing. Alternative B makes domestic sheep and goat grazing unavailable in or within 14.3 miles of Bighorn Sheep Range. Alternative D would result in the fewest AUMs unavailable for grazing. Alternative B places the most restrictions on surface-disturbing activities which limits the placement and construction of range improvement projects. Alternative A is the most likely to apply management on a case-by-case basis. Alternative C and Alternative E fall between the other alternatives.

ASSUMPTIONS AND METHODOLOGY

Construction of new range improvement projects funded by the BLM each year average 33 pits or reservoirs, 9 wells, 1 spring, 10 miles of pipeline, and 20 miles of fence. Construction of new range improvement projects funded by livestock operators annually on BLM-administered lands would likely include 4 pits or reservoirs, 1 well, 1 spring, 18 miles of pipeline, and 5 miles of fence. See Table 1 in *Disturbance Appendix* for short-term and long-term disturbance estimates by type of range improvement project.

IMPACTS COMMON TO ALL ALTERNATIVES

Under all alternatives, vegetation allocation and use levels would be adjusted, if necessary, to meet the Standards for Rangeland Health, which would impact grazing operations and operators. Meeting these standards would provide for a stable amount of forage for livestock grazing. If, however, livestock grazing prevented attainment of Standards for Rangeland Health, including GRSG habitat objectives (Table 2-4),

permit terms and conditions would be modified to ensure progress toward meeting the standards. These modifications would include at least one of the following: a change in the grazing season, a reduction in active AUMs, or a change in the type or number of livestock authorized. Impacts to the grazing permittees and their grazing operation would potentially include alteration of grazing systems, reduction in herd sizes, procurement of additional pasture, or installation of some type of range improvement project. Some changes may be implemented at a financial cost to the producer.

If the standards were not met because of conditions unrelated to livestock grazing, grazing management terms and conditions would potentially remain in effect. Site-specific permit terms and conditions are determined by an interdisciplinary team in consultation with permittees and interested public for each individual allotment. Management actions would be designed to maintain or improve vegetation conditions and include grazing use and grazing activity plans and systems, range improvements, and vegetation treatments. Livestock grazing use would be adjusted to ensure damage to rangeland health does not occur, specifically where drought, fire, flood, insect infestations, or climate change have affected available forage. Affected grazing operations would need to find alternate forage or reduce livestock numbers, depending on the situation. Rangeland improvement projects would allow permittees or lessees to better manage grazing (specifically the distribution and movement of livestock within allotments) and result in varying levels of disturbance.

Projects would be designed to minimize impacts to other resources using the *Mitigation Measures and Conservation Actions* and *Reclamation Appendix*. Some design features may add cost to a project. Implementation of prescribed fire or other types of vegetation treatment may require the temporary exclusion of livestock grazing. Grazing operators would need to find alternate forage during project implementation. Long-term, these types of projects will improve the quality and quantity of the forage resource.

ALTERNATIVE A (No Action)

Summary Statement

Under this alternative, the available BLM-administered surface for livestock grazing would be approximately 2.7 million acres that supported an estimated 546,570 AUMs.

Resources

Avoiding surface-disturbing activities on slopes 30 percent or greater in the Big Dry RMP area would impact 48,000 acres under this alternative. Although it is not likely that range improvement projects would be constructed on these slopes, if no other options existed and the project was determined to be worthwhile, the project would be designed to mitigate soil disturbance. Management actions avoiding mechanical treatment on slopes greater than 15% and limiting ground based harvest and slash-treating equipment to 40% slopes would protect the forage resource.

Harvesting of nonnative hay or seed would reduce the amount of forage available for grazing.

Allowing spring developments would provide livestock operators another possible option for livestock water. Fencing the source would provide clean water.

Stock tanks would not be installed in important wetland and riparian areas within the Big Dry RMP unless no alternative site exists. Stock tanks installed in wetland and riparian areas would be on a case-by case basis in the Powder River RMP. Both management actions would protect the forage resource. Projects would be designed to minimize impacts to the wetland and riparian resource.

Surface disturbing activities allowed in areas of invasive species infestations will increase the risk of weed spread, threatening the forage resource.

Disturbance would not be authorized within 2 miles of sharp-tailed grouse leks or sage grouse leks from March 1 to June 15 (in the Big Dry RMP area). These management actions would delay construction of range improvement projects.

Prohibiting surface-disturbing activities within 1,000 feet of double-crested cormorant and great blue heron rookeries (in the Big Dry RMP area) would prohibit range improvements on 90 acres.
In the Big Dry RMP, BLM lands would be temporarily unavailable for one growing season after a prescribed fire or wildfire. The Powder River RMP would defer grazing on a case by case basis. Affected grazing operators would need to find alternative forage during the time they are not authorized on the BLM lands. Deferment from grazing would give the forage resource an opportunity to recover from the fire event.

Resource Uses

Under this alternative, over the life of the plan, locatable mining would impact an estimated 4,000 BLM-administered surface acres and an estimated 800 AUMs. Livestock grazing would continue if land health standards were being met. Oil and gas development would impact an estimated 448 acres and 90 AUMs Livestock grazing would continue as long as land health standards were being met. Coal development is estimated to impact 489 acres and 98 AUMs. Livestock grazing will resume when reclamation is complete. Other resource and resource use projects are estimated to impact 58,101 acres and 11,620 AUMs over the life of the plan. These impacts are expected to be short-term for most projects.
Livestock grazing would not be allowed on the following SRMAs and recreation area, which would remove 331 acres and 62 AUMs from permitted livestock grazing under this alternative. Implementation would require approximately 4 miles of fence to exclude livestock from these areas. Areas closed would include the:

- Powder River Depot SRMA (and the Powder River Depot ACEC), (171 acres, 51 AUMs in the Conns Coulee Allotment No. 01327), and approximately 3 miles of fence;
- Calypso SRMA, (69 acres, 11 AUMs in the Hines Allotment AMP Allotment No. 01669), and approximately 1 mile of fence. Range improvements would also be excluded on these 69 acres.
- Matthews Recreation Area (91 acres)

Special Designations

- Powder River Depot ACEC (See Powder River Depot SRMA above)

ALTERNATIVE B

Summary Statement

Under this alternative, available AUMs for livestock excluding domestic sheep and goats would be reduced by approximately 8 percent. Available AUMs for domestic sheep and goats would be reduced by 23 percent. Reductions for all livestock grazing would total 215,960 acres and impact between 42,784 and 43,799 AUMs of authorized livestock grazing. Domestic sheep and goats would also be prohibited from grazing on an additional 390,000 acres under this alternative, which would impact an additional 79,803 AUMs. Available AUMs for livestock grazing (excluding domestic sheep and goats) would total between 502,706 and 503,721 AUMs on 2.5 million acres. Available AUMs for domestic sheep and goats would total between 422,903 and 423,918 on 2.1 million acres under this alternative.

Resources

Under this alternative, surface-disturbing activities would not be allowed on 80% of the federal surface, which would eliminate construction of range improvement projects on these acres. The indirect impacts of these actions would eliminate the BLM's ability to influence livestock grazing patterns and distribution through construction of these projects. These management actions would limit projects that assisted in meeting Standards for Rangeland Health, which would result in AUM reductions. Prohibiting disruptive

activities would potentially impact the design, location, and installation timing of range improvement projects, which would increase project costs.

Additional management actions under this alternative would also prohibit surface-disturbing activities unless the activities benefited the resource or were mitigated with specialized design features. BMPs would be used to design projects to reduce the environmental footprint. Design features for range improvement projects would add costs to a project through increased materials or labor.
Under this alternative, spring developments would not be allowed and new livestock water developments (troughs and tanks) would be located at least 0.25 miles from riparian and wetland areas, water bodies, and streams. These actions would maintain the forage resource; however, they limit the ability to manage livestock. Costs for developing livestock water would increase. Prohibiting aboveground power lines unless burial were not technologically feasible would increase the cost for permittees installing power lines to equip stock water wells and other developments.

Establishing sage grouse Priority Areas (PPA) and Restoration Areas (RA) create areas where sage grouse will be the focus. Surface disturbing (range improvement projects) and disruptive activities will not be allowed in PPAs. Projects in sage grouse General Habitat would be subject to maintaining the functionality of the habitat. Proposed projects in the Restoration Area would be subject to the amount of existing development (the number of wells within 1 mile of a lek). Habitat compensation would be required only if the project did not improve sage grouse habitat. Range improvement projects would be used to meet Rangeland Health Standards. Project development may be subject to disturbance caps, particularly in oil and gas areas. Prohibiting range improvement project development would eliminate the BLM's ability to influence livestock grazing patterns and distribution with these projects, which would be designed to maintain or make progress toward meeting Standards for Rangeland Health.

Eliminating renewal and approval of grazing permits for domestic sheep and goats in the Bighorn Sheep Range and within 14.3 miles of the Bighorn Sheep Range would close 390,000 BLM-administered surface acres, an estimated 79,803 AUMs, and 199 allotments to domestic sheep and goat grazing. Five of these allotments are currently authorized for domestic sheep (23,000 acres and 4,392 AUMs). In order for these operators to continue grazing sheep on their private land, operators would have to construct over 150 miles of fence to exclude public land parcels in these five allotments.

Resources Uses

Closing allotments in which the Standards for Rangeland Health were not met and livestock grazing was a causal factor in the failure to meet these standards would impact an estimated 190,000 BLM-administered surface acres, and 39,119 AUMs. This action would impact approximately 7 percent of the total grazing allotment acreage and 7 percent of AUMs in the planning area. In order for operators to continue grazing on their private land, operators would have to construct over 515 miles of fence to exclude public land parcels in these allotments.

Under this alternative, over the life of the plan, locatable mining would impact an estimated 4000 BLM-administered surface acres and temporarily suspend livestock grazing on 800 AUMs. Oil and gas development would impact an estimated 289 acres affecting 57 AUMs. Coal development is estimated to impact 489 acres and 98 AUMs. Livestock grazing will resume when reclamation is complete. Other resource and resource use projects are estimated to impact 20,395 acres and 4,079 AUMs over the life of the plan. These impacts are expected to be short-term for most projects.

Under this alternative, livestock grazing would be suspended until vegetative conditions allowed adequate fuel to carry a prescribed fire. Suspended AUMs would be temporarily unavailable for grazing. Areas affected by wildfire, prescribed fire, or non-fire vegetative treatments would be removed from livestock grazing for a minimum of 2 growing seasons. Suspending use in these areas would result in a temporary loss of available forage, and the permittee would need to provide other feed for the animals while they were removed from BLM-administered lands.

The designation of reserve common allotments (RCAs) would provide opportunities for qualified applicants to graze when their allotments were in deferral for vegetative recovery and restoration. RCAs would facilitate management actions by reducing the financial impact to applicants deferring authorized use of their allotments. RCAs would be designated and managed according to the criteria listed in the *Livestock Grazing Appendix*.

Transferring or renewing grazing permits or leases under this alternative would increase administrative efficiency and allow personnel to be proactive in resource management. Streamlining administrative actions would enable more time to be spent planning and implementing habitat enhancement projects.

Livestock grazing acreage would be reduced by 26,124 acres and AUMs would be reduced by between 3,552 and 4,567 AUMs in SRMAs and proposed SRMAs. Implementation would require approximately 6 miles of fence to exclude livestock from these areas. Areas closed would include the:

- Calypso SRMA (71 acres and 11 AUMs in the Hines Allotment AMP No. 01669), 1 mile of fence;
- Howrey Island proposed SRMA (628 acres and 200 AUMs in the Howrey Island Allotment 10111)
- Pumpkin Creek Ranch and Recreation Area (with an assumed carrying capacity between 2,627 and 3,642 AUMs in the Rogers Allotment No 10509);
- Glendive Short Pine OHV Area proposed SRMA (2,269 acres and 354 AUMs in the Nemitz Individual L Allotment No. 01415), 5 miles of fence;
- Strawberry Hill Recreation Area proposed SRMA (3,616 acres and 292 AUMs in the Hay Creek Allotment No. 10330);
- Moorhead proposed SRMA (10 acres and 3 AUMs in the Sams Allotment No. 10526)
- Matthews Recreation Area proposed SRMA (91 acres)

Special Designations

Livestock grazing acreage would be reduced by 679 acres and AUMs would be reduced by 178 AUMs in ACECs. Implementation would require approximately 7 miles of fence to exclude livestock from these areas. Areas closed would include the:

- Powder River Depot ACEC (171 acres, 51 AUMs in the Conns Coulee Allotment No 01327), with 2 miles of fence
- Big Sheep Mountain ACEC (363 acres, 96 AUMs in the in the Pasture 8 Common East Allotment No. 00926 (162 acres, 39 AUMs), Frank Ban Individual Allotment No. 01225 (121 acres, 34 AUMs), and the Norris AMP Allotment No. 01269 (80 acres, 25 AUMs)), with 3 miles of fence
- Hoe ACEC (145 acres, 31 AUMs in the Tenmile Creek Allotment No. 01312), with 2 miles of fence

ALTERNATIVE C

Summary Statement

Reductions in livestock grazing under this alternative would total 3,851 acres and between 578 and 738 AUMs. Domestic sheep and goats would also be prohibited from grazing on 8,000 acres, which would impact 611 AUMs. Under this alternative, between 545,770 and 545,930 AUMs would be available for livestock (excluding domestic sheep and goats) grazing on 2.7 million acres. Between 544,578 and 544,722 AUMs would be available for domestic sheep and goat grazing on 2.7 million acres). Changes in AUM allocations would have a greater impact on individual allotments and permittees than overall AUM allocations. Approximately 8 miles of fence would be required to exclude livestock from these areas.

Resources

Under this alternative, surface-disturbing activities would not be allowed on 6% of the federal surface, which would eliminate construction of range improvement projects on these acres. The indirect impacts of these

actions would eliminate the BLM's ability to influence livestock grazing patterns and distribution through construction of these projects. These management actions would limit projects that assisted in meeting Standards for Rangeland Health, which would result in AUM reductions.

Additional management actions under this alternative would allow surface-disturbing activities subject to habitat functionality or beneficial outcomes to the resource. BMPs would be used to design projects to reduce the environmental footprint. Design features for range improvement projects may add costs to a project through increased materials or labor.

Depending on the circumstances, harvesting of nonnative or native hay and native seed would make AUMs temporarily unavailable during the year of harvest.

Eliminating grazing permits for domestic sheep and goats in the Bighorn Sheep Range or within 14.3 miles of the Bighorn Sheep Range would impact 4 allotments (55,000 acres and 4,073 AUMs) in which the BLM administers 51 percent or more of the acres. Domestic sheep are not currently authorized in any of these allotments. Because pasture boundary information is limited, it is difficult to determine areas in which the BLM would administer the majority of the pasture; however, it is assumed that areas in which the BLM administers 51 percent or more of the pasture acres would impact 8,000 acres and 611 AUMs under this alternative.

Surface disturbing and disruptive activities in Sage grouse General Habitat would be subject to the amount of existing development (the number of wells within 3.1 miles of a lek) except when the activity maintained sage grouse habitat. Range improvement projects are constructed to improve livestock grazing management, benefiting the forage resource. Surface disturbance in Priority Areas (PPA) are subject to 1 surface disturbance per 640 acres. This management action may limit the potential for range improvement project development, which would eliminate the ability to influence livestock grazing. Restoration Areas allow surface disturbance subject to habitat functionality. Habitat compensation would be required for surface-disturbing projects that did not improve greater sage-grouse habitat. Range improvement projects would be used to meet Rangeland Health Standards. Project development may be subject to disturbance caps, particularly in oil and gas areas. Prohibiting range improvement project development would eliminate the BLM's ability to influence livestock grazing patterns and distribution with these projects, which would be designed to maintain or make progress toward meeting Standards for Rangeland Health.

Resource Uses

Suspending use until land health standards were met in allotments that did not meet and management changes resulted in no progress towards meeting within 5 years, would require permittees to find alternate sources of forage or would require reducing their herd size.

Under this alternative, over the life of the plan, locatable mining would impact an estimated 4,000 BLM-administered surface acres and 800 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Oil and gas development would impact an estimated 454 acres affecting 91 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Coal development is estimated to impact 489 acres and 98 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Other resource and resource use projects are estimated to impact 56,410 acres and 11,282 AUMs over the life of the plan. These impacts are expected to be short-term for most projects.

Suspending livestock grazing until vegetative conditions allowed adequate fuel to carry a prescribed fire would make forage unavailable in the short-term. Deferring livestock use after a wildfire, prescribed fire or non-fire vegetation treatments until the area attained identified vegetative objectives would also make forage unavailable in the short-term. Long-term, the quality and quantity of the forage resource is enhanced.

Limiting the availability of RCAs to county residents would reduce transportation costs, which would increase grazing feasibility. This management action would not have a measured impact on the overall total grazing acreage or available AUMs.

Transferring or renewing grazing permits or leases under this alternative would increase administrative efficiency and allow personnel to be proactive in resource management. Streamlining administrative actions would enable more time to be spent planning and implementing habitat enhancement projects.

Under this alternative, livestock grazing would be reduced by 3,619 acres and between 518 to 678 AUMs in SRMAs and proposed SRMAs. Implementation would require approximately 5 miles of fence to exclude livestock from the following areas:

- Calypso SRMA (71 acres and 11 AUMs in the Hines Allotment AMP No. 01669), with approximately 1 mile of fence;
- Howrey Island proposed SRMA (117 acres, 37 AUMs in the Howrey Island Allotment No. 10111), with up to 2 miles of fence;
- Pumpkin Creek Ranch and Recreation Area proposed SRMA (3,000 acres, 415 to 575 AUMs in the Rogers Allotment No. 10509);
- Glendive Short Pine OHV Area proposed SRMA (330 acres, 52 AUMs in the Nemitz Individual L Allotment No. 01415), with approximately 2 miles of fence;
- Moorhead proposed SRMA (10 acres, 3 AUMs in the Sams Allotment No. 10526)
- Matthews Recreation Area proposed SRMA (91 acres)

Under this alternative, Strawberry Hill Recreation Area would be open to livestock grazing with a restricted season of use. However, the unavailability of water in the winter and the presence of snow would potentially reduce the feasibility of winter grazing. Winter grazing would increase utilization on shrubs.

Special Designations

Under this alternative, livestock grazing would be reduced by 232 acres and 60 AUMs in ACECs. Implementation would require approximately 3 miles of fence to exclude livestock from the following areas:

- Powder River Depot ACEC (19 acres, 5 AUMs in the Conns Coulee Allotment No. 01327);
- Big Sheep Mountain ACEC (194 acres, 51 AUMs in the Pasture 8 Common East Allotment No. 00926 (87 acres, 22 AUMs), Frank Ban Individual Allotment No. 01225 (78 acres, 20 AUMs), and the Norris AMP Allotment No. 01269 (29 acres, 9 AUMs)), with approximately 2 miles of fence;
- Hoe ACEC (19 acres, 4 AUMs in the Tenmile Creek Allotment No. 01312), with approximately 1 mile of fence.

ALTERNATIVE D

Summary Statement

Livestock grazing reductions would total 99 acres and approximately 2 AUMs under this alternative. There would be 546,506 available AUMs on 2.7 million acres of BLM-administered lands. Approximately 1 mile of fence would be required to exclude livestock from this area.

Resources

Under this alternative, surface-disturbing activities would not be allowed on 4% of the federal surface, which would eliminate construction of range improvement projects on these acres. The indirect impacts of these actions would eliminate the BLM's ability to influence livestock grazing patterns and distribution through construction of these projects. These management actions would limit projects that assisted in meeting Standards for Rangeland Health, which would result in AUM reductions.

Additional management actions under this alternative would allow surface-disturbing activities subject to habitat functionality or beneficial outcomes to the resource. BMPs would be used to design projects to reduce the environmental footprint. Design features for range improvement projects may add costs to a project through increased materials or labor.

Harvesting of native and nonnative hay would reduce forage available for grazing.

Surface disturbance in Priority Areas (PPA) are subject to 10% of the sagebrush habitat per 640 acres from the point of disturbance as long as functional sage-grouse habitat and the associated populations were maintained. This management action may limit the potential for range improvement project development, which would eliminate the ability to influence livestock grazing. Surface disturbing activities in Restoration Areas are subject to timing and distance stipulations. Range improvement projects may be rerouted or delayed in accordance with the stipulations. Habitat compensation would be required for surface-disturbing projects that did not improve greater sage-grouse habitat. Range improvement projects would be used to meet Rangeland Health Standards. Project development may be subject to disturbance caps, particularly in oil and gas areas. Prohibiting range improvement project development would eliminate the BLM's ability to influence livestock grazing patterns and distribution with these projects, which would be designed to maintain or make progress toward meeting Standards for Rangeland Health.

Resource Uses

Suspending use until land health standards were met in allotments that did not meet and management changes resulted in no progress towards meeting within 5 years, would require permittees to find alternate sources of forage or would require reducing their herd size.

Under this alternative, over the life of the plan, locatable mining would impact an estimated 4,000 BLM-administered surface acres and 800 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Oil and gas development would impact an estimated 461 acres affecting 92 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Coal development is estimated to impact 489 acres and 98 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Other resource and resource use projects are estimated to impact 62,803 acres and 12,560 AUMs over the life of the plan. These impacts are expected to be short-term for most projects.

Deferring livestock grazing on a case-by-case basis (with permittee cooperation) to ensure the presence of adequate fuel to carry a prescribed fire or until established seed set in the growing season following wildfire, prescribed fire, or non-fire vegetative treatments would temporarily limit forage available for grazing. Affected permittees would need to provide alternative feed for their livestock while animals were not on BLM-administrated lands.

Restricting the designation of RCAs under this alternative would eliminate BLM-administered areas available for permittees to graze while their allotments were in deferral. Costs to obtain private grazing land for this purpose would be too prohibitive for many livestock operations.

Transferring or renewing grazing permits or leases under this alternative would increase administrative efficiency and allow personnel to be proactive in resource management. Streamlining administrative actions would enable more time to be spent planning and implementing habitat enhancement projects.

The Howrey Island, Moorhead Recreation Area, and Glendive Short Pine OHV area would be open to livestock grazing with a restricted season of use. However, the unavailability of water in the winter and the presence of snow would potentially reduce the feasibility of winter grazing. Winter grazing would increase utilization on shrubs. In the Glendive OHV area, herbaceous vegetation would receive dormant season grazing that would increase vigor. In the Howrey Island area, livestock mortality would result if livestock fell through ice on the Yellowstone River while attempting to access water.

Under this alternative, livestock grazing would be reduced by 91 acres in the Matthews Recreation Area proposed SRMA.

Special Designations

Under this alternative, livestock grazing acreage would be reduced by 8 acres and 2 AUMs in ACECs. Implementation would require approximately 1 mile of fence to exclude livestock from the following area:

- Hoe ACEC (8 acres and 2 AUMs in the Tenmile Creek Allotment No. 01312), with approximately 1 mile of fence.

ALTERNATIVE E (Proposed)

Summary Statement

Reductions in livestock grazing under this alternative would total 139 acres and 12 AUMs. Approximately one mile of fence would be required to exclude livestock from these areas.

Resources

Under this alternative, surface-disturbing activities would not be allowed on 3% of the federal surface, which would eliminate construction of range improvement projects on these acres. The indirect impacts of these actions would eliminate the BLM's ability to influence livestock grazing patterns and distribution through construction of these projects. These management actions would limit projects that assisted in meeting Standards for Rangeland Health, which would result in AUM reductions.

Additional management actions under this alternative would allow surface-disturbing activities subject to habitat functionality or beneficial outcomes to the resource. Required design features, mitigation measures, and conservation actions would be used to design projects to reduce the environmental footprint. Design features for range improvement projects may add costs to a project through increased materials or labor.

Surface disturbance and disruptive activities would be avoided in Priority Habitat Management Areas. This management action may limit the potential for range improvement project development, which would eliminate the ability to influence livestock grazing. Costs to implement a range improvement project will increase.

Resource Uses

Suspending use until land health standards were met in allotments that did not meet and management changes resulted in no progress towards meeting within 5 years, would require permittees to find alternate sources of forage or would require reducing their herd size.

Under this alternative, over the life of the plan, locatable mining would impact an estimated 4,000 BLM-administered surface acres and 800 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Oil and gas development would impact an estimated 564 acres affecting 113 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Coal development is estimated to impact 489 acres and 98 AUMs. Livestock grazing will resume as areas are reclaimed and Standards for Rangeland Health are met. Other resource and resource use projects are estimated to impact 62,656 acres and 12,531 AUMs over the life of the plan. These impacts are expected to be short-term for most projects.

Suspending livestock grazing until vegetative conditions allowed adequate fuel to carry a prescribed fire would make forage unavailable in the short-term. Deferring livestock use after a wildfire, prescribed fire or non-fire vegetation treatments until the area attained identified vegetative objectives would also make forage unavailable in the short-term. Long-term, the quality and quantity of the forage resource is enhanced.

The designation of RCAs would provide opportunities for grazing by qualified applicants when their allotments were in deferral for vegetative recovery and restoration. RCAs would facilitate management actions by reducing the financial impact to applicants deferring authorized use of their allotments. RCAs would be designated and managed according to the criteria listed in the *Livestock Grazing Appendix*.

Transferring or renewing grazing permits or leases under this alternative would increase administrative efficiency and allow personnel to be proactive in resource management.
Under this alternative, livestock grazing would be reduced by 101 acres and 3 AUMs in proposed SRMAs. Implementation would require approximately 1 mile of fence to exclude livestock from the following area:

- Moorhead proposed SRMA, (10 acres, 3 AUMs in the Sams Allotment No. 10526)
- Matthews Recreation Area proposed SRMA (91 acres)

Special Designations

Under this alternative, livestock grazing would be reduced by up to 38 acres and 9 AUMs in ACECs. Implementation would require approximately 1 mile of fence to exclude livestock from the following areas:

- Powder River Depot ACEC (19 acres, 5 AUMs in the Conns Coulee Allotment No. 01327);
- Hoe ACEC (19 acres, 4 AUMs in the Tenmile Creek Allotment No. 01312), with approximately 1 mile of fence.

CUMULATIVE IMPACTS

The primary cumulative effects for each alternative would be the total amount of AUMS reduced or displaced within the planning area and the total number of sheep AUMS reduced. Allotments are closed or forage availability is reduced because of long-term surface-disturbing activities under each alternative, the decreased amount of AUMS produced by BLM-administered land is either lost or replaced by production elsewhere (Table 4-31).

**TABLE 4-31.
ANIMAL UNIT MONTHS BY ALTERNATIVE**

Impact	Alternative				
	A	B	C	D	E
Total AUMS Reduced or Suspended	12,498	46,557	19,214	18,874	18,983
Reduction or Suspension as a Percentage of Planning Area Forage Requirements (%)	<1	<1	<1	<1	<1
Sheep AUMS Reduced	0	4,392	611	0	0
Reduction as a Percentage of Planning Area Sheep Herd Forage Requirements (%)	N/A	2	<1	N/A	N/A

For purposes of this analysis within the planning area, it is assumed that 10,575,600 AUMS of forage are required by cattle herds and 224,400 AUMS of forage are required by sheep herds (NASS 2011).

MINERALS

COAL

ASSUMPTIONS AND METHODOLOGY

The coal leasing decisions made in the Big Dry and Powder River RMPs (BLM 1996 and 1985c) would be carried forward in this RMP and include areas identified as acceptable for further consideration for coal leasing. Most of these lands are located within areas defined as Coal with Development Potential (Map 35). As a result, the lands considered as acceptable for further consideration for coal leasing found in the Big Dry and Powder

River RMPs should be taken into consideration for purposes of impact analysis in this document. The coal screening process would be applied on a case-by-case basis in response to individual coal lease applications. The explanation of the coal leasing process located in those RMP appendices is reproduced in the *Minerals Appendix*.

According to the U.S. Energy Information Administration (EIA) *Annual Energy Outlook 2013*, the demand for coal in the United States would decrease in the near term as a result of flat demand for electricity, increasing share of electricity generated from renewables, low natural gas prices and high coal prices. The EIA *Annual Energy Outlook 2013* also forecasts that new requirements to control emissions of mercury and acidic gases will result in shutting down some coal fired power plants which will contribute to the suppression of near term demand for coal. However, after 2016, EIA forecasts that coal production will increase about 0.6 percent per year through 2040, as a result of increased coal exports and an increased demand for domestic coal for electricity generation due to increasing natural gas prices.

A Reasonably Foreseeable Developed Scenario (RFD) was prepared for coal, based on the EIA projections, which provides an estimate of production and surface disturbance for future mining. The RFD can be found in the coal section of the *Minerals Appendix*.

IMPACTS COMMON TO ALL ALTERNATIVES

Under this plan, leasing decisions would be carried forward from the Powder River and Big Dry RMPs and approximately 1.0 million acres (containing 65.63 billion tons of coal) identified in the Powder River RMP and 580,547 acres (containing 6.18 billion tons of coal), identified in the Big Dry RMP would be available for further consideration for leasing. Proposals would be evaluated for their suitability for leasing through the reapplication of the unsuitability criteria or the full coal-screening process or both, as needed. Surface owner consultation would be conducted, if needed, during site-specific planning for a lease application. It is assumed that certain unspecified greenhouse gas emission reduction measures would be considered during the environmental analysis conducted in response to individual lease requests.

If a decision is made to lease federal coal and the coal is mined, these actions would represent an irreversible or irretrievable commitment of the coal resource.

Coal leasing and ownership would be affected by land management actions such as future mineral or surface exchanges. The BLM may exchange federal coal for private coal to protect important alluvial valley floors and may also exchange federal coal for private coal in other areas as part of a mineral-for-mineral exchange.

Since coal leasing decisions are being carried forward from previous planning this analysis is restricted to coal exploration activities. Exploratory coal drilling would be conducted in accordance with all applicable federal and state laws, policies, and regulations. The BLM would strive to observe all agreements, guidelines, and policies pertaining to resource protection and enhancements when evaluating coal exploration license applications.

Protective management actions, including reclamation requirements, would be attached to exploration licenses to mitigate impacts to resources and some activities would be denied, if necessary. This action would subject the project proponent to delays, additional expenses, and altered exploration plans.

ALTERNATIVE A (No Action)

Summary Statement

Coal exploration under this alternative would not be allowed on about 212,485 acres of BLM-administered coal mineral estate (Table 4-32). About 40,280 acres fall within the areas designated as coal with development potential which is one of the four coal screens applied during previous planning. As described elsewhere, the coal screening process was used during previous planning to determine areas of coal that would be designated as acceptable for further consideration for leasing.

Disallowing exploratory coal activities would prevent data collection through drilling on coal deposits in some areas and impact companies' decisions to lease coal.

Timing restrictions would be required on about 4.2 million acres of BLM-administered coal mineral estate (Table 4-33).

**TABLE 4-32.
BLM-ADMINISTERED ACRES WHERE COAL EXPLORATION IS DISALLOWED
UNDER ALTERNATIVE A**

Resource	Mineral Acres	Acres in the Coal with Development Potential Polygons
Sharp-tailed Grouse, 0.25-mile buffer	88,000	22,000
Nesting Waterbirds, 1,000-foot buffer	560	20
Greater sage-grouse, 0.25-mile buffer WSAs	30,000 93,925	4,600 13,660
Total (includes overlapping acres)	**212,485**	**40,280**

**TABLE 4-33.
BLM-ADMINISTERED ACRES SUBJECT TO TIMING RESTRICTIONS
UNDER ALTERNATIVE A**

Resource	Mineral Acres	Acres in the Coal with Development Potential Polygons
Sharp-tailed Grouse	2,700,000	500,000
Greater sage-grouse	1,500,000	89,000
Total	**4,200,000**	**589,000**

In addition, mitigation plans that would be required for drilling proposals on slopes 30 percent or greater would be required for activities proposed on 280,000 acres of BLM-administered coal mineral estate and 27,000 acres of BLM-administered coal mineral estate in Coal with Development Potential polygons in the planning area. These actions would delay permitting and increase the operator's costs for exploratory coal drilling. The operator could also decide not to drill in certain areas due to delays and added expense.

ALTERNATIVE B

Summary Statement

Coal exploration under alternative B would not be allowed on about 5,149,397 acres of BLM-administered coal mineral estate (Table 4-34). This figure includes overlapping areas where coal drilling would be disallowed. If the overlapping areas are dissolved (not counted twice) then there are about 6,471,056 acres where coal exploratory drilling would be disallowed. About 870,560 disallowed acres fall within the areas

designated as coal with development potential. Disallowing exploratory coal activities would prevent data collection through drilling on coal deposits in some areas and impact companies' decisions to lease coal.

In areas where coal exploratory drilling would be allowed mitigation such as specialized design features, or requiring maintenance of habitat functionality would likely be required. These actions would delay permitting and increase the operator's costs for exploratory coal drilling. However, requirements for specialized design features or mitigation would allow the operation to occur. Reaching the habitat disturbance cap from coal exploration associated with sage grouse habitat would require proponents to compensate for the loss of habitat in order to conduct exploration for BLM-administered coal resources, which would subsequently increase the cost of exploration.

Coal exploration would be diminished under this alternative because it would be prohibited on about 6,471,056 acres (without overlapping acres) of BLM-administered coal mineral estate. Without data on the coal resource, it is unlikely the mining companies would be able to determine the extent of the coal resource; consequently, this action would reduce future coal leasing.

TABLE 4-34.
BLM-ADMINISTERED ACRES WHERE COAL EXPLORATION IS DISALLOWED UNDER ALTERNATIVE B

	Area or Resource	Mineral Acres	Acres in the Coal with Development Potential Polygons
Soil	Badlands, Outcrops	273,965	6,952
Water	Waterbodies	107,123	0
	Source Water Protection Areas	27,311	5,063
Veg.	Riparian and wetlands	363,247	48,878
Fish and Wildlife	Aquatics, sport-fish reservoir, 0.5 miles of designated reservoirs with fisheries	16,446	863
	Big Game Crucial Winter Range	1,749,452	423,791
	Colonial Waterbirds, 0.25-mile buffer	840	28
	Bighorn Sheep Range	123,665	7,254
	Raptors, 0.5-mile buffer	294,733	128,400
	Piping Plover, 0.25-mile buffer	80,151	0
	Least Tern. 0.25-mile buffer	68,546	0
	Black-tailed Prairie Dogs, 0.50-mile buffer	431,373	139,098
	Pallid Sturgeon, 0.5-mile buffer	40,582	0
	Sage Grouse Restoration, 1 mile buffer	20,300	7,410
	Sage Grouse Priority	1,428,898	79,577
	LWC	28,840	9586
	VRM I (WSAs)	93,925	13,660
	Total	**5,149,397**	**870,560**

ALTERNATIVE C

Summary Statement

Coal exploration under alternative C would not be allowed on about 323,452 acres of BLM-administered coal mineral estate (Table 4-35). This figure includes overlapping areas where coal drilling would be disallowed. If the overlapping areas are dissolved (not counted twice) then there are about 168,108 acres where coal

exploratory drilling would be disallowed. About 13,659 acres where exploratory coal drilling would be disallowed fall within the areas designated as coal with development potential. Disallowing exploratory coal activities would prevent data collection through drilling on coal deposits in some areas and impact companies' decisions to lease coal.

TABLE 4-35.
BLM-ADMINISTERED COAL MINERAL ACRES WHERE COAL EXPLORATION IS DISALLOWED UNDER ALTERNATIVE C

Area or Resource		Mineral Acres	Acres in the Coal with Development Potential Polygons
Fish and Wildlife	Black-tailed Prairie Dogs, 0.25-mile buffer	188,915	0
	Pallid Sturgeon	40,582	0
	VRM Class I, (WSAs)	93,955	13,659
Total		**323,452**	**13,659**

In areas where coal exploratory drilling would be allowed mitigation such as specialized design features, or requiring maintenance of habitat functionality would likely be required. These actions would delay permitting and increase the operator's costs for exploratory coal drilling. However, requirements for specialized design features or mitigation would allow the operation to occur. Reaching the habitat disturbance cap from coal exploration associated with sage grouse habitat would require proponents to compensate for the loss of habitat in order to conduct exploration for BLM-administered coal resources, which would subsequently increase the cost of exploration.

ALTERNATIVE D

Summary Statement

Coal exploration under alternative D would not be allowed on about 93,925 acres of BLM-administered coal mineral estate (Table 4-36). About 13,659 acres where exploratory coal drilling would be disallowed fall within the areas designated as coal with development potential. Disallowing exploratory coal activities would prevent data collection through drilling on coal deposits in some areas and impact companies' decisions to lease coal.

In areas where coal exploratory drilling would be allowed mitigation such as specialized design features, or requiring maintenance of habitat functionality or avoidance would likely be required. These actions would delay permitting and increase the operator's costs for exploratory coal drilling. However, requirements for specialized design features or mitigation would allow the operation to occur. Reaching the habitat disturbance cap from coal exploration associated with sage grouse habitat would require proponents to compensate for the loss of habitat in order to conduct exploration for BLM-administered coal resources, which would subsequently increase the cost of exploration.

TABLE 4-36.
BLM-ADMINISTERED COAL MINERAL ACRES WHERE COAL EXPLORATION IS DISALLOWED UNDER ALTERNATIVE D

Area or Resource	Mineral Acres	Acres in the Coal with Development Potential Polygons
VRM Class 1 (WSAs)	93,925	13,659
Total	**93,925**	**13,659**

ALTERNATIVE E (Proposed)

Summary Statement

Coal exploration under alternative E would not be allowed on about 93,925 acres of BLM-administered coal mineral estate (Table 4-37) pursuant to 43 CFR 3410.1-1(a)(1) and 43 CFR 3465.1(d). There are no areas of overlapping polygons where coal exploration activity is disallowed. About 13,659 acres where exploratory coal drilling would be disallowed fall within the areas designated as coal with development potential.

In areas where coal exploratory drilling would be allowed mitigation such as specialized design features, or requiring maintenance of habitat functionality or avoidance would likely be required. These actions would delay permitting and increase the operator's costs for exploratory coal drilling. However, requirements for specialized design features or mitigation would allow the operation to occur.

TABLE 4-37.
BLM-ADMINISTERED COAL MINERAL ACRES WHERE COAL EXPLORATION IS DISALLOWED UNDER ALTERNATIVE E

Area or Resource	Mineral Acres	Acres in the Coal with Development Potential Polygons
VRM Class 1 (WSAs)	93,925	13,659
Total	**93,925**	**13,659**

CUMULATIVE IMPACTS

In the past, the BLM has made additional BLM-administered coal reserves available by processing Leases by Application and Lease Modification submittals for the existing coal mines, which has been sufficient to provide enough BLM-administered coal to mines, when it is needed. In the future, the BLM would continue to consider leasing requests to provide additional reserves to the existing mines at about the same rate as in the past. Although it is very difficult to predict, the BLM may receive leasing requests for new mine development within the planning area.

Prior to submitting leasing requests, coal companies typically conduct exploration to locate and develop new reserves. Coal companies have been able to conduct exploration as needed with only a few seasonal restrictions. This ability to conduct exploration enables the coal companies to make long-range development plans that sustain the mining operations at current production levels or allows them to expand in accordance with market demands. The management actions proposed under this RMP would have a cumulative effect on exploratory coal drilling and possibly leasing, as described below.

Alternative A and C

The cumulative impacts to coal exploration drilling that would result from these two alternatives are similar as the acres where coal drilling would not be allowed under A and C are fairly close (see tables above). Generally, in the future coal companies would be able to continue to explore for new reserves around existing mines and within polygons designated as areas with future coal development potential (from past planning). However, there are some areas where this would not be allowed which would require the proponents to make adjustments to exploration plans. If data could not be obtained from exploratory drilling for coal resources it could impact coal company's long-term planning to apply for additional coal leases. In addition, mitigation would likely be required to protect or reduce impacts to resources which would increase costs or possibly cause delays in a proposed activity

Alternative B

Under Alternative B future, exploration by coal companies would be severely restricted due to the number of acres where coal exploration would be disallowed and other restrictions emplaced. Subsequently, coal companies would not be able to continue to explore as necessary to define additional BLM-administered coal resources, which would cause less coal to be leased. This could adversely affect future sustainability and growth of existing mines depending on the availability of private and state coal resources.

Alternatives D and E (Proposed)

The cumulative impacts to coal exploratory drilling that would result from these two alternatives would be the same. Areas where exploration drilling activity would be disallowed due to resource concerns would not have a noticeable negative effect on the ability of coal companies to conduct exploration in the future. Thus, it would not impact, to any measurable degree, the ability of coal companies to obtain additional federal coal in the future. It is possible that some operations would be denied depending on the resource involved and many other undermined variables analyzed at the time the action is proposed. As a result coal exploratory drilling at existing mines, as well as in other areas, would continue; however, mitigation would likely be required to protect or reduce impacts to resources which would increase costs.

OIL AND GAS

ASSUMPTIONS AND METHODOLOGY

The impact that the planning process results have upon the fluid minerals program can be measured directly in terms of the reduction of federal subsurface acreage available for lease as well as the acreage closed to leasing and acreage subject to major (No Surface Occupancy (NSO)) and minor (Timing Limitation (TL) and Controlled Surface Use (CSU)) leasing constraints. These values can then be used to project the ensuing reduction in the number of wells that will be drilled, the reduction in federal oil and gas production, and ultimately, the reduction in revenues from federal leases and production, and the subsequent reduction in federal funds distributed to state and local governments. Only discretionary closed acres are listed in the tables listed below.

Prior to the process of alternative formulation, a baseline RFD scenario was prepared (BLM, 2013), which is available upon request, to provide a reasonable projection of potential oil and gas development activity within the planning area over the next 20 years. The planning area consists of approximately 25,816,530 million total mineral acres, of which approximately 5,008,000 million are BLM-administered oil and gas mineral estate. The estimates within the baseline RFD scenario were developed based on the technical review and analysis of past, present, and potential future exploratory, development, and production operations and activities for oil, gas, and coal bed methane gas (CBNG) within the planning area. The technical review and analysis considered USGS assessments, past and current development, feedback and data from operators and the Montana Board of Oil and Gas Conservation (MBOGC), and resource expertise of the planning area (BLM, 2013). The federal baseline RFD does not include projected well numbers for minerals privately owned, owned by the state of Montana, owned by the local government, or lands administered by other federal agencies.

After the proposed alternatives were developed, an RFD scenario was created for each alternative in an attempt to quantify projected development activity levels per alternative. The thought process is that each proposed protective measure can affect oil and gas development activities by not allowing leasing, restricting surface occupancy, controlling surface use, or adding restrictive mitigation as Conditions of Approval (COAs) on federal Applications for Permit to Drill (APDs). The result is a RFD by alternative that utilizes the proposed lease stipulations in order to calculate a percent reduction in total well numbers and total surface disturbance from the baseline RFD. The Carter MLP is proposed as part of Alternative C (see Table 2-5); therefore, an RFD was projected only for Alternative C using the Carter MLP baseline scenario.

After the projected wells/surface disturbance per alternative have been quantified, the BLM can use this information to estimate the potential impacts that fluid mineral development may have upon the different

resources. From a resource perspective, well disturbances (versus well numbers) are an indicator of human presence and are considered a disruptive activity.

Surface disturbance may vary by type of well due to the fact that the size of the required drilling equipment may vary and also because multiple wells may be drilled from one surface location. The amount of surface disturbance needed for a well may also vary by the surface topography and soil type. The estimate of surface disturbance by well type is included in the baseline RFD scenario (BLM, 2013).

The terms and conditions of existing oil and gas leases would not be changed by the decisions in this document. However, post-lease actions or authorizations (e.g., APDs or road or pipeline ROWs) would potentially be encumbered by mitigation measures, as necessary, on a case-by-case basis as required through project-specific NEPA analysis or other environmental review. The stipulations and COAs would be in accordance with laws, regulations, and lease terms. The lease stipulations and permit COAs allow for management of federal oil and gas resources in concert with other resources and land uses. When a lease expires, it would be managed for oil and gas according to the decisions reached in this document.

An average of four NOIs to conduct oil and gas geophysical exploration operations would be filed within the planning area each year. Geophysical operations would not be allowed on BLM-administered lands closed to oil and gas leasing. Geophysical operations would be allowed on BLM-administered lands open to oil and gas leasing.

Federal oil shale leasing would not likely occur in either the short or the long-term because economically mineable deposits of oil shale are not known to exist within the planning area. This is not to be confused with shale oil plays such as the Bakken in North Dakota and Montana, in which the objective is to find brittle layers in subsurface shale thousands of feet below the surface, drill horizontal holes along those brittle layers, artificially fracture the rock, and produce the resulting oil.

Acre figures in all tables represent federal mineral acres, and are approximations based on GIS analysis that have been rounded to the nearest whole acre or well. The acreages represent a single stipulation's areal extent; although there may be areas where multiple stipulations overlap; therefore, adding these figures will not result in accurate total acreage values.

SUMMARY OF IMPACTS BY ALTERNATIVE

All alternatives make federal oil and gas minerals available for lease while minimizing adverse impacts to the environment, public health and safety, and other resource values and uses. Alternative B (i.e. this alternative has the most acres closed to leasing) would result in the greatest level of protection from additional oil and gas surface disturbing and disruptive activities followed by Alternative E, A, C, and D respectively as a result of acres proposed with NSO (these alternatives have the same percent of acres closed to leasing). Conversely, Alternative B would also result in the greatest number of projected federal wells not drilled (573 wells not drilled) thereby greatly reducing development of federal oil and gas minerals and federal royalties. Alternatives C, A, and D offer the most federal oil and gas mineral acres with CSU and TL and the fewest acres with NSO which results in the most number of projected federal oil and gas wells drilled within the planning (41, 147, and 16 wells not drilled respectively). Alternative E also offers acres with CSU and TL, but it is the alternative with the most acres offered with NSO, which results in 168 federal wells not drilled (compared to 573, 41, 147, and 16).

IMPACTS COMMON TO ALL ALTERNATIVES

Restrictions for surface-disturbing or disruptive activities would require additional activities, features, timing, relocation, other mitigation, or buried infrastructure to minimize impacts to resources. These restrictions would decrease lease values, increase operating costs, cause the relocation of wells and production sites, and hinder orderly and efficient field development. Restrictions applied to protect certain surface resources would prevent drilling of some BLM-administered wells.

Federal oil and gas mineral lands closed to leasing include lands with legislative imposed restrictions (non-discretionary closures) and the lands proposed as no leasing in each alternative (discretionary closures). Lands closed to leasing preclude surface-disturbing or disruptive activities from oil and gas operations, which provide the greatest protection for the environment. However, this greatly reduces development of federal oil and gas minerals and federal royalties within the planning area.

The NSO stipulation is considered the most restrictive and is generally thought of as a major constraint for fluid mineral leasing and development. While a NSO stipulation may not entirely preclude a lease from being developed, the restriction of surface occupancy would require that any wells and associated facilities be located on adjacent lands. If applicable, directional and horizontal drilling technology may allow an operator to effectively reach out and develop some of the smaller blocks of NSO-leased lands; however, larger contiguous blocks of NSO would likely be precluded from any future development. This would result in federal wells not being drilled and a loss of royalties.

The CSU and TL stipulations are less restrictive than NSO and are generally considered as minor constraints for leasing. Specifically, the CSU stipulation requires an appropriate plan to be submitted and approved prior to the BLM authorizing any oil and gas projects in these areas. The timing stipulation specifies certain dates throughout the year that oil and gas projects will be allowed to commence in the stipulated area. While these two types of stipulations do not preclude development, they may delay, limit, and possibly relocate oil and gas activities within the stipulated areas. Also, the CSU stipulation may place more scrutiny upon monitoring oil and gas projects in a given area, increasing the economic burden on the operator.

For NSO, CSU, and TL stipulations, if applicable, waivers, exceptions, and modifications (WEMs) criteria could be applied to the lease stipulation; therefore, the projected impacts to fluid mineral leasing may be lessened.

Federal oil and gas mineral lands open to leasing without stipulations included with the lease is the least restrictive constraint. Lands in this category would be offered for lease with the standard lease terms and conditions of the federal lease.

Best Management Practices (BMPs), which may be attached as Conditions of Approval (COAs) on an application for permit to drill (APD), would not preclude development; however, they may delay, limit, and possibly relocate oil and gas activities on the lease. This would increase the economic burden on the operator.

Surface reclamation or stabilization of all disturbed areas is required by federal regulations (Onshore Oil and Gas Order No. 1). This includes interim reclamation for the area of the well pad and access road not needed for production during the economic life of the well and final reclamation for the area of the well pad and access road being abandoned. Additional requirements or prescriptions attached as COAs to achieve required reclamation success could increase the costs of oil and gas development

Prohibiting geophysical operations on BLM-administered surface would result in the denial of future permits to conduct geophysical exploration on BLM-administered surfaces in the planning area. This would impact the configuration of geophysical projects that would otherwise include BLM-administered surface and the quality, accuracy, and extent of subsurface data collected from the restricted geophysical operations.

ALTERNATIVE A (No Action)

Alternative A projected 7,377 new oil and gas wells would be drilled of which 1,285 (17 percent) would be BLM-administered wells which is 90 percent of the federal wells projected in the planning area RFD baseline scenario. This alternative would allow a large percent of federal wells for recovery of oil and gas mineral resources by allowing the greatest number of acres disturbed while optimizing existing infrastructure.

This alternative proposes the most acres to be encumbered with TL for big game winter range, grouse nesting habitat, and raptor nest sites, 1,848,469 acres, 37 percent of the federal oil and gas mineral estate in the planning area (Map 8, Table 4-38). Multiple timing limitations in this alternative would restrict development activities

for nine months or more. The large percentage of acres with TL would greatly hinder orderly field development by prolonging drilling of federal wells or concentrating the drilling of federal wells during a short time period.

TABLE 4-38.
ACRES OF LEASING STIPULATIONS FOR THE PLANNING AREA UNDER ALTERNATIVE A

Closed	No Surface Occupancy	Controlled Surface Use	Timing Limitation	Open (with Standard Lease Terms and Conditions)
86,651	**1,473,375**	**574,940**	**1,848,469**	**1,080,790**

In Alternative A, the 2 percent of the oil and gas mineral estate closed to oil and gas leasing, and the 29 percent encumbered with NSO stipulations would result in 147 wells, 10 percent, not being drilled in the planning area. The acres closed, with NSO stipulations, and CSU stipulations (11percent), are scattered throughout the planning area and, as a result, would have little or no effect on orderly development of oil and gas activities in general, but could affect a specific project. However, NSO and CSU stipulations would increase the economic burden on the operator as a result of siting of the well pad and facilities or use of new drilling technology and the mitigation and/or monitoring measures addressed in the appropriate project plan respectively.

Alternative A has 1,080,790 acres (22 percent) open to oil and gas leasing with standard lease terms and conditions.

Geophysical exploration would not be allowed on 147,748 acres (5 percent) of BLM-administered surface estate. This would have little or no effect on conducting geophysical exploration on BLM-administered surfaces in the planning area but could affect a specific project.

ALTERNATIVE B

Alternative B projects 6,953 new wells would be drilled of which 859 (12 percent) would be BLM-administered wells, 60 percent of the federal wells projected in the planning area RFD baseline scenario. Alternative B would have 30 percent less BLM-administered wells drilled than Alternative A. This alternative provides the lowest potential for recovery of oil and gas resources and revenue from the federal wells over the life of the plan. Under this alternative annual drilling and development of wells would be inadequate to maintain or efficiently utilize existing oil and gas infrastructure.

This alternative has the most acres closed to oil and gas leasing, 1,572,176 acres (31 percent), 29 percent more than Alternative A (Map 9, Table 4-39). Approximately 88 percent of the acres closed to leasing are attributed to greater sage-grouse priority habitat and the remaining acreage is attributed to riparian areas, cultural resource areas, wildlife resources, multiple ACECs and numerous SRMAs/ERMAs. Acres closed to leasing would preclude oil and gas development.

TABLE 4-39.
ACRES OF LEASING STIPULATIONS FOR THE PLANNING AREA UNDER ALTERNATIVE B

Closed	No Surface Occupancy	Controlled Surface Use	Timing Limitation	Open (with Standard Lease Terms and Conditions)
1,572,176	**2,094,816**	**1,142,793**	**0**	**211,001**

The 2,094,816 acres, 42 percent, proposed with NSO stipulation is the highest acreage compared to Alternative A with 13 percent. In this alternative, 75 percent of the acres proposed with NSO stipulations are attributed to sensitive soils, with the remainder 25 percent attributed to multiple ACECs, water resources, soils classified as badlands/rock out crop, and various wildlife resources. The contiguous blocks of NSO acres would render large

areas of oil and gas minerals inaccessible to development even with the use of directional and horizontal drilling technology.

Alternative B would greatly reduce the number of federal wells drilled within the planning area. With 42 percent of the acres encumbered with NSO stipulations and 31 percent closed to oil and gas leasing, a total of 573 federal wells, 40 percent, would not be drilled, the highest number of federal wells not be drilled compared to Alternative A with 10 percent federal wells not drilled. As a result, federal royalties would be greatly reduced in the planning area.

This alternative does not have acres proposed with TL stipulations. The acres encumbered with CSU stipulations cover 23 percent (1,142,793 acres) of the federal oil and gas minerals. The multiple CSU acres are large contiguous blocks that would not preclude oil and gas development, but would delay, limit, and possibly relocate oil and gas activities more than Alternative A. This would also increase the economic burden on the operator even more to meet the increased requirements for mitigation and monitoring.

Alternative B has 211,001 acres (12 percent) open to oil and gas leasing with standard lease terms and conditions, the least acres compared to Alternative A. With the high percentages of closed acres and acres with NSO stipulation, Alternative B would be in general the most restrictive and would have the highest economic impact to oil and gas resource recovery and revenue compared to Alternative A.

Geophysical exploration would not be allowed on 1,259,597 acres (46 percent) of BLM-administered surface estate. This would affect geophysical exploration on BLM-administered surfaces by precluding three projects per year.

ALTERNATIVE C

Alternative C projects 7,484 new wells would be drilled of which 1,391 (19 percent) would be BLM-administered wells, 97 percent of the federal wells projected in the planning area RFD baseline scenario. Alternative C would be 7 percent more BLM-administered wells drilled than Alternative A and 37 percent more than Alternative B. This alternative, like Alternative A, would allow for recovery of oil and gas mineral resources and optimize existing infrastructure.

The acres closed to oil and gas leasing, 83,160 acres, 2 percent, the same as Alternative A, and 29 percent less than Alternative B. Like Alternative A, the acres closed to leasing would have little or no effect on orderly development of oil and gas activities in general but could affect a specific project.

There are 287,691 acres, 6 percent, encumbered with NSO stipulations, 23 percent less than Alternative A and 36 percent less than Alternative B (Map 10, Table 4-40). Similar to Alternative A, the NSO acres are scattered throughout the planning area and, as a result, would have little or no effect on orderly development of oil and gas activities in general but could affect a specific project. However, NSO stipulations would increase the economic burden on the operator as a result of siting of the well pad and facilities or the use of new drilling technology.

TABLE 4-40.
ACRES OF LEASING STIPULATIONS FOR THE PLANNING AREA UNDER ALTERNATIVE C

Closed	No Surface Occupancy	Controlled Surface Use	Timing Limitation	Open (with Standard Lease Terms and Conditions)
83,160	**287,691**	**4,205,502**	**0**	**434,651**

The number of wells not drilled as a result of acres closed to leasing (2 percent) and acres encumbered with NSO stipulations (5 percent) would be 41 federal wells, 106 less federal wells than Alternative A and 532 more than Alternative B. This would have little or no effect on orderly development of oil and gas activities.

This alternative does not have acres proposed with timing limitations, but it has the most acres proposed with CSU stipulations, 4,205,502 acres (84 percent), 73 percent more than Alternative A and 61 percent more than Alternative B. The acres encumbered with CSU stipulations are attributed to various wildlife resources including greater sage-grouse general and priority areas, sensitive and badlands/rock out crop soil resources, water resources, visual resources, cultural resources, and ACECs. The multiple CSU acres are large contiguous blocks that would delay, limit, possibly relocate oil and gas activities, and increase the economic burden on the operator to meet the increased requirements for mitigation and monitoring by 73 percent more than Alternative A and 61 percent more than Alternative B.

Of the 60 percent of the acres encumbered with CSU stipulations, 47 percent are attributed to greater sage-grouse priority area. The stipulation limits surface disturbance to 1 surface disturbance per 640 acres with a cumulative, direct, and indirect disturbance of no more than 3 percent of the sagebrush habitat per 640 acres from the point of disturbance, as long as functional greater sage-grouse habitat and the associated populations were maintained at the same level as trend areas. If an application for permit to drill was submitted and the acres of disturbance limit was already met within the 640 acres, the permit would not be approved until the disturbed areas are fully reclaimed to pre-disturbance conditions or to a desired plant community before additional disturbance would be approved. However, a permit could be approved by restricting surface occupancy and use of the stipulated area by directionally or horizontally drilling the well, if technically feasible, equivalent to a NSO stipulation.

Alternative C has 434,651 acres (9 percent) open to oil and gas leasing with standard lease terms and conditions, the third highest acres compared to Alternatives A and B.

Geophysical exploration would not be allowed on 92,278 acres (3 percent) of BLM-administered surface estate. This would have little or no effect on conducting geophysical exploration on BLM-administered surfaces in the planning area in general but could affect a specific project.

In the Master Leasing Plan area, Alternative C projects 89 new wells would be drilled of which 65 (73 percent) would be BLM-administered, 100 percent of the federal wells projected in the MLP RFD baseline scenario. The stipulated acres in the Master Leasing Plan area follow the same trend as the planning area, except for acres closed to leasing and acres encumbered with timing limitations, and acres open with standard lease terms and conditions.

Therefore, the impacts to oil and gas mineral resources in the Master Leasing Plan area would be the same as described above for the planning area Alternative C for acres encumbered with NSO and CSU stipulations (Map 10, Table 4-41). All the federal wells would be drilled under this alternative.

TABLE 4-41.
ACRES OF LEASING STIPULATIONS FOR THE MASTER LEASING PLAN UNDER ALTERNATIVE C

Closed	No Surface Occupancy	Controlled Surface Use	Timing Limitation	Open (with Standard Lease Terms and Conditions)
0	**2,045**	**283,162**	**0**	**0**

ALTERNATIVE D

Alternative D projects 7,508 new wells would be drilled of which 1,416 (19 percent) would be BLM-administered wells, 99 percent of the federal wells projected in the planning area RFD baseline scenario. Alternative D would have 16 wells not drilled, 131 less than Alternative A, 25 less than Alternative C, and 558 less than Alternative B. This alternative would allow for more recovery of oil and gas mineral resources and optimize existing infrastructure than Alternatives A and C.

Acres closed to oil and gas leasing, 83,160 acres, 2 percent, are the same as Alternatives A and C, and 29 percent less than Alternative B. Like Alternatives A and C, the acres closed to leasing would have little or no effect on orderly development of oil and gas activities in general but could affect a specific project.

There are 99,442 acres, 2 percent, encumbered with NSO stipulations, which is the fewest number of acres of NSO compared to Alternatives A, B, and C (Map 11, Table 4-42). The NSO acres are scattered throughout the planning area and, as a result, would have little or no effect on orderly development of oil and gas activities in general but could affect a specific project. However, NSO stipulations would increase the economic burden on the operator, 29 percent less than Alternatives A, 3 percent less than Alternative C, and 40 less than Alternative B, as a result of siting of the well pad and facilities or the use of new drilling technology.

TABLE 4-42.
ACRES OF LEASING STIPULATIONS FOR THE PLANNING AREA UNDER ALTERNATIVE D

Closed	No Surface Occupancy	Controlled Surface Use	Timing Limitation	Open (with Standard Lease Terms and Conditions)
83,160	**99,442**	**4,119,996**	**0**	**715,163**

The number of federal wells not drilled in this alternative as a result of acres closed to oil and gas leasing and acres encumbered with NSO stipulations is 16 federal wells. This would have little or no effect on orderly development of oil and gas activities.

Like Alternatives B and C, this alternative does not have acres proposed with TL stipulations, but it does have the second highest acres proposed with CSU stipulations, 4,119,996 acres, 82 percent, compared to Alternative A with 11 percent, Alternative B with 23 percent, and Alternative C with 84 percent. The multiple CSU acres are large contiguous blocks that would not preclude oil and gas development, but would delay, limit, and possibly relocate oil and gas activities more than Alternatives A, B, and C. This would greatly increase the economic burden on the operator by the percentages listed above, to meet the increased requirements for mitigation and monitoring.

Of the 82 percent of the acres encumbered with CSU stipulations, 33 percent are attributed to greater sage-grouse priority area. The stipulation limits surface to a cumulative, direct, and indirect disturbance of no more than 10 percent of the sagebrush habitat per 640 acres from the point of disturbance, as long as functional greater sage-grouse habitat and the associated populations were maintained at the same level as trend areas. If an application for permit to drill was submitted and the acres of disturbance were already met within the 640 acres, the permit would not be approved until the disturbed areas are fully reclaimed to pre-disturbance conditions or to a desired plant community before additional disturbance would be approved. However, a permit could be approved by restricting surface occupancy and use of the stipulated area by directionally or horizontally drilling the well, if technically feasible, equivalent to a NSO stipulation.

Alternative D has 715,163 acres (14 percent) open to oil and gas leasing with standard lease terms and conditions, the third highest acres compared to Alternatives A, B, and C.

Geophysical exploration would not be allowed on 100,515 acres (4 percent) of BLM-administered surface estate. This would have little or no effect on conducting geophysical exploration on BLM-administered surfaces in the planning area in general but could affect a specific project.

ALTERNATIVE E (Proposed)

Alternative E projects 7,343 new wells would be drilled of which 1,252 (17 percent) would be BLM-administered wells, 88 percent of the federal wells projected in the planning area RFD baseline scenario. Alternative E would have 2 percent less BLM-administered wells drilled than Alternatives C, and D, 5 percent more than Alternative B, and same as Alternative A. This alternative would allow for recovery of oil and gas

mineral resources and would adequately maintain a moderate pace of drilling and development of wells and efficiently utilize existing oil and gas infrastructure.

The acres closed to oil and gas leasing, 83,160 acres, 2 percent, the same as Alternatives A, C, and D, and 29 percent less than Alternative B (Map 12, Table 4-43). Like Alternatives A, C, and D, the acres closed to leasing would have little or no effect on orderly development of oil and gas activities in general but could affect a specific project.

TABLE 4-43.
ACRES OF LEASING STIPULATIONS FOR THE PLANNING AREA UNDER ALTERNATIVE E

Closed	No Surface Occupancy	Controlled Surface Use	Timing Limitation	Open (with Standard Lease Terms and Conditions)
83,160	**1,952,253**	**2,498,686**	**6,986**	**483,786**

There are 1,952,253 acres, 39 percent, encumbered with NSO stipulations, the second highest acres of NSO compared to all alternatives. In this alternative, 74 percent of the acres proposed with NSO stipulations are attributed to greater sage-grouse priority area, with the remainder 2 percent attributed to multiple ACECs, various wildlife resources, water resources, and SRMAs/ERMAs. The contiguous blocks of NSO acres would render large areas of oil and gas minerals inaccessible to development even with the use of directional and horizontal drilling technology, if technically feasible.

Under this alternative, the number of federal wells not drilled as a result of acres closed to oil and gas leasing and acres encumbered with NSO stipulations is 181 federal wells, 13 percent, the second highest percent compared to the other alternatives. Precluding drilling of 168 federal wells would affect orderly development of oil and gas activities in areas with large contiguous blocks of NSO acres. These areas are predominately in the northern portion of Garfield County and the southern portion of the planning area.

This alternative has 6,986 acres, less than 1 percent, proposed with timing limitations that would limit oil and gas operations for five months or more. The relatively small percentage of acres with timing limitation would have little or no effect on orderly development of oil and gas activities compared to Alternative A.

The acres proposed with CSU stipulations, 2,498,686 acres, 50 percent, the third highest acres compared to the other four alternatives. The CSU stipulation acres are attributed to wildlife resources, sensitive soils, riparian areas, ACECs, recreation, and visual resources. The multiple CSU acres are large contiguous blocks that would not preclude oil and gas development, but would delay, limit, relocate oil and gas activities, and increase the economic burden on the operator to meet the increased requirements for mitigation and monitoring by 2 percent more than Alternatives A, 27 percent more than Alternative B, 10 percent less than Alternative C, and 22 percent less than Alternative D.

Alternative E has 483,786 acres (10 percent) open to oil and gas leasing with standard lease terms and conditions, the third highest acres compared to all the alternatives.

Geophysical exploration would not be allowed on 151,262 acres (5 percent) of BLM-administered surface estate. This would have little or no effect on conducting geophysical exploration on BLM-administered surfaces in the planning area in general but could affect a specific project.

CUMULATIVE IMPACTS

Cumulative impacts to oil and gas resources include continued increases in restrictions on oil and gas development, which would limit future development. Lease values would be reduced by increased oil and gas leasing stipulations and regulations. Restrictions would change the pace of development by delaying or denying approvals and increasing drilling of off lease wells. Federal lease developments would be affected by a reduced number of wells drilled on leases with oil and gas leasing stipulations, an increased number of

wells drilled on leases with minimal constraints, and an increase in operating costs as a result of land use decisions, oil and gas leasing stipulations, and regulations.

Restrictions on BLM-administered leases would impact the leasing and development of adjacent leasable minerals not administered by the BLM. An exploration company may forego development on BLM-administered acres or intensely develop leases on nearby state and private mineral estate because restrictions on BLM-administered mineral estate would leave the company unable to develop on the BLM-administered mineral estate.

Alternative A (No Action)

Alternative A would contribute to cumulative impacts to the mineral estate. This alternative would allow drilling and development to continue at a slow, irregular pace under numerous restrictions for resource protection. Under this alternative, oil and gas well development would be expected to occur within the predicted RFD range. There would be 7,377 wells drilled of which 1,285 would be BLM-administered wells. Of these, 1,079 would be producing BLM-administered wells. The acres of short-term surface disturbance associated with the BLM-administered drilled wells would be 2,784 acres, and 853 acres for producing wells.

Under this alternative, there would be a total of 147 federal wells not drilled in the planning area, 60 fewer federal oil wells drilled, 50 fewer conventional federal gas wells drilled, and 37 fewer federal CBNG wells drilled than projected in the RFD.

Alternative B

Alternative B would contribute to cumulative impacts to the mineral estate. This alternative would be the most restrictive for oil and gas drilling and development. The increased number of closures and restricted acres would limit development in the planning area. Applying closures and restrictions to BLM-administered oil and gas minerals would result in a decrease in the number of conventional oil, gas, and CBNG wells developed over both the short and long-term. There would be 6,953 wells drilled of which 861 would be BLM-administered wells. Of these, 723 would be producing BLM-administered wells. The acres of short-term surface disturbance associated with the BLM-administered drilled wells would be 1,838 acres, and 565 acres for producing wells.

Under this alternative, there would be a total of 573 federal wells not drilled in the planning area, 227 fewer federal oil wells drilled, 190 fewer conventional federal gas wells drilled, and 156 fewer federal CBNG wells drilled than projected in the RFD.

Alternative C

Alternative C would contribute to cumulative impacts to the mineral estate. This alternative would allow drilling and development to continue at a slow, irregular pace under numerous restrictions for resource protection. Under this alternative, oil and gas well development would be expected to occur within the predicted RFD range. There would be 7,484 wells drilled of which 1,391 would be BLM-administered wells. Of these, 1,165 would be producing BLM-administered wells. The acres of short-term surface disturbance associated with the BLM-administered drilled wells would be 3,028 acres, and 926 acres for producing wells.

Under this alternative, there would be a total of 41 federal wells not drilled in the planning area, 15 fewer federal oil wells drilled, 13 fewer conventional federal gas wells drilled, and 13 fewer federal CBNG wells drilled than projected in the RFD.

Alternative D

Alternative D would contribute to cumulative impacts to the mineral estate. This alternative would allow drilling and development to continue at a slow, irregular pace under numerous restrictions for resource protection. Under this alternative, oil and gas well development would be expected to occur within the predicted RFD range. There would be 7,508 wells drilled of which 1,416 would be BLM-administered wells.

Of these, 1,186 would be producing BLM-administered wells. The acres of short-term surface disturbance associated with the BLM-administered drilled wells would be 3,079 acres, and 941 acres for producing wells.

Under this alternative, there would be a total of 16 federal wells not drilled in the planning area, 7 fewer federal oil wells drilled, 6 fewer conventional federal gas wells drilled, and 3 fewer federal CBNG wells drilled than projected in the RFD.

Alternative E (Proposed)

Alternative E would contribute to cumulative impacts to the mineral estate. This alternative would restrict and limit drilling and development on BLM-administered minerals under an increased number of restricted acres. There would be 7,343 wells drilled of which 1,251 would be BLM-administered wells. Of these, 1,053 would be producing BLM-administered wells. The acres of short-term surface disturbance associated with the BLM-administered drilled wells would be 2,681 acres, and 824 acres for producing wells.

Under this alternative, there would be a total of 181 federal wells not drilled in the planning area, 80 fewer federal oil wells drilled, 68 fewer conventional federal gas wells drilled, and 33 fewer federal CBNG wells drilled than projected in the RFD.

LOCATABLE MINERALS

ASSUMPTIONS AND METHODOLOGY

The potential for many locatable minerals (including gold, chromium, titanium, zeolite, and associated minerals such as copper, lead, and zinc) in the planning area is very low and the potential for other locatable minerals (such as bentonite and uranium) is high.

Although gold placer mining occurred in the Yellowstone River as far downstream as Miles City, there is no record of the quantity of the gold recovered. It is assumed that recreational collection of gold and agates and “rock hounding” will continue.

Bentonite is exposed extensively in the planning area and contains the highest potential for development in the planning area.

The regulations which pertain to locatable mineral exploration and development activity only apply to BLM managed surface estate with all minerals reserved (about 2.2 million acres excluding acquired lands). A rare exception would involve some split estate lands which were obtained under the Stock Raising Homestead Act. It is assumed that mining claims would continue to be filed and two bentonite mines would be active over both the short and long-term.

It is also assumed that a uranium insitu leach mining operation would be developed in the long-term. Exploration for locatable minerals would also continue over the short and long-term. See the *Minerals Appendix* for the locatable minerals RFD scenarios.

Operators must submit a Notice for exploration actions above casual use as defined at 43 CFR 3809.21 that would disturb less than 5 acres and do not meet the requirements of 43 CFR 3809.11. Most notice level activity in the planning area would result from bentonite exploratory drilling, which is conducted using an auger drill mounted on 1- or 2-ton trucks that travel overland from site to site. No roads, trails, or surface disturbance other than the auger hole usually occurs. Drilling could also occur for uranium exploration.

Larger drill trucks similar to the ones used for water-well drilling would be required, as would support vehicles. Either a NOI or a Plan of Operations (PO) may be required, depending on the level of surface disturbance. It is most likely that the only locatable mineral exploration and development conducted in the planning area would occur in the locatable mineral RFD area as described in the *Minerals Appendix* (Map 34). However, there is also a possibility that exploration or development could occur outside the RFD.

If mining claims were present, all land exchanges would be subject to the valid existing rights of the mining claimant.

IMPACTS COMMON TO ALL ALTERNATIVES

The activity described in a NOI or PO could not cause unnecessary or undue degradation. If the proposed activity, however, would cause unnecessary or undue degradation then the NOI would not be accepted or the PO would not be approved and the proponent must modify operations to prevent unnecessary or undue degradation. The modified proposal could include actions designed to mitigate or eliminate impacts to resources of concern from the proposed activities. The term unnecessary and undue degradation, as it applies to locatable mineral activity, is described in the surface management regulations in 43 CFR 3809.5 and its prevention addressed in 43 CFR 3809.415. The definition of mitigation includes elimination of the action or parts of an action. However, for operators exercising their rights under the Mining Law of 1872, as Amended, the BLM can only stipulate mitigation requiring that the operator eliminate the action or part of the action necessary to achieve compliance with a Federal of State environmental law (such as the Clean Air Act, Clean Water Act, or ESA, etc.)

If the proposal could not be modified such that unnecessary or undue degradation would not occur then it may be possible to deny operations. This would subject the claimant or operator to delays, additional mitigation, additional expense, possible loss of revenue, and alteration of mining plans.

If surface disturbance was proposed in certain special management lands (SRMA, ACEC) totaling about 64,614 acres, validity examinations may be conducted on the related mining claims in these areas.

Although the validity exam could find that the claims are valid, invalid claims would be declared null and void. A mixture of valid and invalid claims would potentially also result. Existing valid mining claims would remain on the property and potentially explored for mineralization or mined if the proposal were in accordance with the surface management regulations found at 43 CFR 3809 and would not result in unnecessary or undue degradation. Validity exams would cause delay, additional mitigation, additional expense, possible loss of revenue, and alteration of mining plans for the claimant or operator.

ALTERNATIVE A (No Action)

Summary Statement

Under Alternative A, locatable mineral activities would be very minimally impacted. Management actions that could potentially deny surface-disturbing or disruptive activities would affect locatable mineral activity on approximately 90 locatable mineral acres due to nesting water bird habitat concerns. This would subject the claimant or operator to possible denial of proposals, delays, additional mitigation, additional expense, possible loss of revenue, and alteration of mining plans.

ALTERNATIVE B

Summary Statement

Alternative B requires withdrawing about 1.04 million acres of federal minerals within greater sage-grouse Habitat Priority areas from mineral entry subject to valid existing rights. Those acres are BLM administered surface and mineral estate where the surface management regulations for locatable minerals would apply. Mining claims can also be staked on some private lands patented under the Stock Raising Homestead Act. There are about 133,481 acres of land patented under this act in the planning area. It is unknown how many of these acres lie within the Greater sage-grouse priority areas. Withdrawing minerals under private surface would tend to prevent exploration- and mining-related impacts and eliminate any income for the private surface owner related to surface damage or access fees from potential developers. Withdrawals more than 5,000 acres must be approved by the United States Congress, and smaller withdrawals are approved by the Secretary of the Interior.

The locatable minerals within the subject lands would no longer be available for location of claims (subject to valid existing rights) from future locatable mineral uses for as long as the withdrawal remained in effect. As a result, future mining claims would be invalid and would not be recorded, explored, and developed. Existing mining claims may constitute valid existing rights unless otherwise determined by the BLM. Upon receipt of a Notice or Plan of Operations mineral examination reports would be prepared for each claim within the proposed activity area by the BLM, to determine validity of the claims. Mineral examination reports would potentially involve obtaining mineral samples from the mining claim, which might involve surface-disturbing activities such as drilling. Claims that the BLM determined to be invalid would potentially be subject to contest hearings for a final determination of the validity of the claims. Invalid claims would be declared null and void. If a final departmental decision declared the claim to be null and void, the operator must cease all operations except for reclamation.

If the BLM had not completed the mineral examination report or if there were pending contest proceedings, the BLM may approve a PO or NOI that was limited to taking samples to confirm the existence of the locatable minerals or to allow the claimant to perform minimum annual assessment work. The following management actions would apply to proposed locatable mineral actions related to valid existing rights in the withdrawn areas; those actions necessary to facilitate mineral examination reports, or actions allowed to enable the claimant to perform minimum annual assessment work as described above.

Management actions that could potentially deny surface-disturbing or disruptive activities under Alternative B would impact locatable mineral activity on approximately 86,089 locatable mineral acres. This would subject the claimant or operator to possible denial of proposals, delays, additional mitigation, additional expense, possible loss of revenue, and alteration of mining plans (Table 4-44).

TABLE 4-44.
BLM-ADMINISTERED LOCATABLE MINERAL ACRES
INVOLVING POTENTIAL DENIAL UNDER ALTERNATIVE B

Area or Resource		Locatable Mineral Acres
Fish and Wildlife	All Species Raptor Nest Site ½ mile buffer[1]	73,788
	Piping Plover and Least Tern Habitat ¼ mile buffer[1]	3,491
	Pallid Sturgeon ½ mile buffer[1]	8,810
	Total	86,089

[1] **Mitigation would potentially include denial of the activity or some part of the proposed activity.**

ALTERNATIVE C

Summary Statement

Management actions that could potentially deny surface-disturbing or disruptive activities under Alternative C would impact locatable mineral activity on approximately 8,810 locatable mineral acres due to Pallid Sturgeon habitat concerns. This would subject the claimant or operator to possible denial of proposals, delays, additional mitigation, additional expense, possible loss of revenue, and alteration of mining plans.

ALTERNATIVES D and E (Proposed)

Summary Statement
There are no management actions under alternatives D and E which would result in denial of locatable mineral surface disturbing or disruptive activities.

CUMULATIVE IMPACTS

Locatable mineral entry, exploration, and mining would continue to be allowed in most areas on lands open to mineral location and administered through existing surface and mineral management regulations (43 CFR 3715,

3800, 3809). However, there are some management actions that would prohibit surface-disturbing activities related to locatable mineral activities.

Locatable mineral exploration and development activity is concentrated in the southeastern corner of the planning area, which has been actively mined for bentonite since about 1977. There are currently about 17,025 acres of federal and private lands under permit, and about 6,222 acres of these have been disturbed by mining. Approximately 2,600 acres have been fully reclaimed and released from reclamation liability.

It is expected that mining permits would be sought within the bentonite RFD area over the next 20 years, which would include about 21,545 mixed public and private acres. There are about 12,325 acres of BLM-administered surface (57.2 percent) in the RFD area in which the BLM would have permitting responsibilities. In order to assist in developing mining plans and exploring for new reserves, bentonite exploratory drilling would also occur in advance of mining.

There has been interest in developing in-situ recovery uranium mining operations in the Wyoming Powder River Basin and the Southern Black Hills areas. In 2008, there was interest in developing several known sandstone-hosted, roll-front type uranium deposits in Carter County to determine the economic viability of a potential uranium in-situ recovery operation. An RFD area (about 76,000 acres, of which approximately 34,000 are BLM-administered) for uranium, has been established for analysis purposes.

Within the short and long-term, exploratory drilling would occur within the uranium RFD area. The drill holes would range from 500 to 2,000 feet deep but it is not possible to predict if related surface disturbance would occur (such as road construction or pits for drilling fluids). It is also unknown how many exploratory sites would be drilled, but it is estimated to be several hundred or more. If reserves were proven and the economics favorable, it is possible (within the long-term) that an in situ leaching facility for uranium extraction would be constructed and occupy or disturb from 2,500 to 16,000 acres.

Although it is very likely that locatable mineral exploration and development would continue to occur in the long-term, it is also possible that resource concerns (such as impacts to threatened and endangered species) would preclude mining in some areas. It is also likely that some protective measures, design features, and other stipulations would be incorporated into POs to provide additional mitigation and protection for resource values such as greater sage-grouse. However, these mitigation measures must also comply with the Mining Law of 1872, as Amended and may or may not include all measures described in this document. Because they are located within the same general area, there would also be some overlap of bentonite and uranium disturbances.

Minerals that were mined would be made available for use and result in an irretrievable commitment of resources. Mitigation would be employed to reduce environmental harm and the disturbed lands would be reclaimed.

MINERAL MATERIALS

ASSUMPTIONS AND METHODOLOGY

It is assumed that five mineral materials permits (most likely for sand or gravel) would be issued per year over both the short and long-term. Each mineral material site would operate for approximately 5 years, disturb about 5 acres, and yield about 50,000 cubic yards of material. It is also assumed that recreational rock collecting on a casual use basis for collectable stones (such as petrified wood and agate) would continue at the current rate.

IMPACTS COMMON TO ALL ALTERNATIVES

About 52,350 acres would be closed to mineral material development under Impacts Common to All alternatives (Table 4-45). The total number of BLM-administered mineral material acres in the planning area is 5.6 million, and 52,350 acres is less than 1 percent of the total.

**TABLE 4-45.
BLM-ADMINISTERED MINERAL MATERIAL ACRES CLOSED
UNDER IMPACTS COMMON TO ALL ALTERNATIVES**

ACEC	Acres
Ash Creek Divide	8,100
Bug Creek	3,800
Hell Creek	26,000
Sand Arroyo	11,000
Big Sheep Mountain	360
Hoe	150
Jordan Bison Kill	120
Powder River Depot	1,200
Seline	80
Finger Buttes	1,500
Smoky Butte	40
Total	**52,350**

In areas where BLM administered mineral material development would be allowed it is possible that mitigation would be required to eliminate or lessen the impacts to resources. Mitigation could include relocating the operation to a better area and/or requiring specialized design features to sufficiently mitigate impacts and allow the operation to occur. This would cause additional expense and delay to the proponents of the projects in these areas

Free Use Permits for mineral materials are often issued to governmental and nonprofit entities. Local governments utilize the material for use on county roads, which lowers building and maintenance costs for county infrastructure. Mitigation or denial of operations would increase taxpayer costs if the operator was forced to move operations to a privately owned mineral materials deposit. Issuing free use mineral material permits and sales contracts would cause an irreversible commitment of resources commensurate with the number of new authorizations and the volume of materials removed.

ALTERNATIVE A (No Action)

Disallow surface-disturbing activities and/ or mineral material sales or development Under Alternative A would decrease the ability of developers (e.g., construction firms, county road departments) to explore and develop new BLM-administered reserves where needed (Table 4-46). About 183,916 acres of BLM administered mineral materials would not be allowed to be developed due to concerns over impacts resulting from surface disturbing activities. This figure includes overlapping areas where mineral material development would be disallowed. The overall result would be fewer acres of BLM administered mineral materials available. In areas where BLM administered mineral material development would be allowed it is possible that mitigation would be required to eliminate or lessen the impacts to resources. Mitigation could include relocating the operation to a better area and/or requiring specialized design features to sufficiently mitigate impacts and allow the operation to occur. This would cause additional expense and delay to the proponents of the projects in these areas.

ALTERNATIVE B

Disallowing mineral material sales or development under Alternative B would drastically decrease the ability of developers (e.g., construction firms, county road departments) to explore and develop new BLM-administered reserves where needed. About 3,846,334 acres of BLM administered mineral materials would not be allowed to be developed due to concerns over impacts resulting from surface disturbing activities (Table 4-47). This figure includes overlapping areas where mineral material development would be disallowed. If the overlapping areas are dissolved (not counted twice) then there are about 3,473,904 acres where mineral material development would be disallowed. The overall result would seriously curtail mineral

material development on BLM-administered minerals in southeastern Montana. Although the overall result would be fewer acres of mineral materials available and subsequently disturbed on BLM-administered mineral estate, these actions would not eliminate the disturbance because it is likely that the disturbance would shift to an area of private mineral acres not subject to these restrictions (possibly even adjacent to BLM-administered mineral acres).

TABLE 4-46.
BLM-ADMINISTERED MINERAL MATERIAL ACRES WHERE MINERAL MATERIAL DEVELOPMENT WOULD BE NOT ALLOWED OR CLOSED UNDER ALTERNATIVE A

	Area or Resource	Acres
Fish and Wildlife	Sharp-tailed Grouse Leks and Nesting Habitat, 0.25-mile buffer	41,246
	Colonial Waterbirds, 1,000-foot buffer	288
	Greater sage-grouse General .25 mile	10,582
	Greater sage-grouse Restoration .25 mile	4,128
	WSAs	95,243
Rec.	Lewis and Clark Trail SRMA	20,906
	Battle Butte ACEC	121
	Reynolds Battlefield ACEC	288
	Black Footed Ferret ACEC	11,114
		183,916

TABLE 4-47.
BLM-ADMINISTERED MINERAL MATERIAL ACRES WHERE MINERAL MATERIAL DEVELOPMENT WOULD BE NOT ALLOWED OR CLOSED UNDER ALTERNATIVE B

	Area or Resource	Acres
Soils	Badlands, Rock Outcrop	254,034
Water	Source Water Protection Areas	7,601
	Waterbodies and streams	53,911
	100 Year Flood Plain	109,786
Veg.	Riparian and wetlands	167,399
Fish and Wildlife	Big Game Crucial Winter Range	1,395,626
	Colonial Waterbirds, 0.25-mile buffer	238
	Bighorn Sheep Range	97,320
	Special Status Species Raptors, 0.5-mile buffer	184,455
	Piping Plover, 0.25-mile buffer	49,758
	Interior Least Tern, 0.25-mile buffer	53,943
	Black-tailed Prairie Dogs, 0.5-mile buffer	333,919
	Pallid Sturgeon	16,236
	Sage Grouse Restoration 1 mile Buffer	15,988
	Sage Grouse Priority	1,355,105
Rec.	Moorhead SRMA	6,265
	Lewis and Clark Trail SRMA	19,366
	Dean S. Reservoir SRMA	161
	Pumpkin Creek Ranch and Recreation Area SRMA	7,373
	Glendive Short Pine OHV Area SRMA	2,753

TABLE 4-47.
BLM-ADMINISTERED MINERAL MATERIAL ACRES WHERE MINERAL MATERIAL DEVELOPMENT WOULD BE NOT ALLOWED OR CLOSED UNDER ALTERNATIVE B

Area or Resource		Acres
	Recreational Fisheries	12,233
	Strawberry Hill Recreation Area SRMA	2,319
	VRM	126,000
Special Desig. Areas	Reynolds Battlefield	2,273
	Cedar Creek Battlefield	4569
	Flat Creek Paleontological	547
	Powderville Paleontological Area	23,695
	Long Medicine Wheel	1,056
	Walstein	1,518
	WSAs	92849
	LWC	28,840
	Battle Butte	830
	Black Footed Ferret ACEC	11,099
Total		**3,846,334**

Under Alternative B greater sage-grouse habitat compensation would be required if the activity did not improve sage grouse habitat. This would be problematic for operators because they are typically small construction firms or rural counties that use mineral materials for nearby road jobs. The costs of habitat compensation would outweigh the value of the mineral materials. Therefore, it is unlikely that these operators would be able to comply with these actions and they would seek a different area of unrestricted private mineral acres. The disturbance would not be eliminated but simply shifted to an area of private minerals. In areas where BLM administered mineral material development would be allowed it is possible that mitigation would be required to eliminate or lessen the impacts to resources. Mitigation could include relocating the operation to a better area and/or requiring specialized design features to sufficiently mitigate impacts and allow the operation to occur. This would cause additional expense and delay to the proponents of the projects in these areas.

ALTERNATIVE C

Disallowing mineral material sales or development under Alternative C would slightly decrease the ability of developers (e.g., construction firms, county road departments) to explore and develop new BLM-administered reserves where needed. About 266,438 acres of BLM administered mineral materials would not be allowed to be developed due to concerns over impacts resulting from surface disturbing activities (Table 4-48). This figure includes overlapping areas where mineral material development would be disallowed. If the overlapping areas are dissolved (not counted twice) then there are about 249,706 acres where mineral material development would be disallowed. The overall result would be slightly fewer acres of mineral materials available for development. There would be very minor to no noticeable effect on the ability of developers to obtain BLM managed mineral materials under this alternative.

TABLE 4-48.
BLM-ADMINISTERED MINERAL MATERIAL ACRES WHERE MINERAL MATERIAL DEVELOPMENT WOULD BE NOT ALLOWED OR CLOSED UNDER ALTERNATIVE C

Area or Resource		Acres
Fish and Wildlife	Black-tailed Prairie Dogs, 0.25-mile buffer	145,185
	Pallid Sturgeon	16,236
	Black Footed Ferret ACEC	11,099
	WSA VRM I	93,918
Total		**266,438**

Under Alternative C greater sage-grouse habitat compensation would be required if the activity did not improve sage grouse habitat. This would be problematic for operators because they are typically small construction firms or rural counties that use mineral materials for nearby road jobs. The costs of habitat compensation would outweigh the value of the mineral materials. Therefore, it is unlikely that these operators would be able to comply with these actions and they would seek a different area of unrestricted private mineral acres. The disturbance would not be eliminated but simply shifted to an area of private minerals.

In areas where BLM administered mineral material development would be allowed it is possible that mitigation would be required to eliminate or lessen the impacts to resources. Mitigation could include relocating the operation to a better area and/or requiring specialized design features to sufficiently mitigate impacts and allow the operation to occur. This would cause additional expense and delay to the proponents of the projects in these areas.

ALTERNATIVE D

Disallowing mineral material sales or development under Alternative D would slightly decrease the ability of developers (e.g., construction firms, county road departments) to explore and develop new BLM-administered reserves where needed. About 104,987 acres of BLM administered mineral materials would not be allowed to be developed due to concerns over impacts resulting from surface disturbing activities (Table 4-49). This figure includes overlapping areas where mineral material development would be disallowed. If the overlapping areas are dissolved (not counted twice) then there are about 90,860 acres where mineral material development would be disallowed. The overall result would be slightly fewer acres of mineral materials available for development. There would be very minor to no noticeable effect on the ability of developers to obtain BLM managed mineral materials under this alternative.

Under Alternative D greater sage-grouse habitat compensation would be required if the activity did not improve sage grouse habitat. This would be problematic for operators because they are typically small construction firms or rural counties that use mineral materials for nearby road jobs. The costs of habitat compensation would outweigh the value of the mineral materials. Therefore, it is unlikely that these operators would be able to comply with these actions and they would seek a different area of unrestricted private mineral acres. The disturbance would not be eliminated but simply shifted to an area of private minerals.

In areas where BLM administered mineral material development would be allowed it is possible that mitigation would be required to eliminate or lessen the impacts to resources. Mitigation could include relocating the operation to a better area and/or requiring specialized design features to sufficiently mitigate impacts and allow the operation to occur. This would cause additional expense and delay to the proponents of the projects in these areas.

TABLE 4-49.
BLM-ADMINISTERED MINERAL MATERIAL WHERE MINERAL MATERIAL DEVELOPMENT WOULD BE NOT ALLOWED OR CLOSED UNDER ALTERNATIVE D

	Area or Resource	Acres
Fish and Wildlife	WSAs VRM I	93,888
	Black Footed Ferret ACEC	11,099
	Total	**104,987**

ALTERNATIVE E (Proposed)

Disallowing or closing mineral material sales or development under Alternative E would decrease the ability of developers (e.g., construction firms, county road departments) to explore and develop new BLM-administered reserves where needed. About 146,472 acres of BLM administered mineral materials would not be allowed to be developed due to concerns over impacts resulting from surface disturbing activities (Table 4-50). This figure includes overlapping areas where mineral material development would be disallowed. If the overlapping areas are dissolved (not counted twice) then there are about 116,607 acres where mineral material development would be disallowed. The overall result would be fewer acres of mineral materials available for development. There would be very minor to no noticeable effect on the ability of developers to obtain BLM managed mineral materials under this alternative.

Under Alternative E greater sage-grouse habitat compensation would be required if the impacts from the activity were not fully mitigated. This would be problematic for operators because they are typically small construction firms or rural counties that use mineral materials for nearby road jobs. The costs of habitat compensation would outweigh the value of the mineral materials. Therefore, it is unlikely that these operators would be able to comply with these actions and they would seek a different area of unrestricted private mineral acres. The disturbance would not be eliminated but simply shifted to an area of private minerals.

In areas where BLM administered mineral material development would be allowed it is possible that mitigation would be required to eliminate or lessen the impacts to resources. Mitigation could include relocating the operation to a better area and/or requiring specialized design features to sufficiently mitigate impacts and allow the operation to occur. This would cause additional expense and delay to the proponents of the projects in these areas.

TABLE 4-50.
BLM-ADMINISTERED MINERAL MATERIAL ACRES WHERE MINERAL MATERIAL DEVELOPMENT WOULD BE NOT ALLOWED OR CLOSED UNDER ALTERNATIVE E

	Area or Resource	Acres
Recreation	Dean S. Reservoir	161
	Glendive OHV	2,271
	Moorhead	6,265
	Strawberry Hill	2,319
Special Desig. Areas	Battle Butte	319
	Reynolds Battlefield	879
	Cedar Creek Battlefield	1,021
	Flat Creek Paleontological Site	547
	Powderville Paleontological Area	9304
	Long Medicine Wheel	179
	Walstein	1,518
	WSAs VRM I	9,2849
	LWC	28,840
	Total	**146,472**

CUMULATIVE IMPACTS

Alternative A (No Action)

Under Alternative A about 183,916 acres of BLM administered mineral materials would not be allowed to be developed. An additional 52,350 acres would be closed to mineral material development under *Impacts Common to All alternatives* for a total of about 236,266 acres which would either be closed or not allowed to be developed for mineral materials.

Alternative B

Under Alternative B about 3,846,334 acres of BLM administered mineral materials would not be allowed to be developed. An additional 52,350 acres would be closed to mineral material development under *Impacts Common to All Alternatives* for a total of about 3,898,694 acres which would either be closed or not allowed to be developed for mineral materials. When overlapping restrictions are dissolved (overlaps removed) the total acres closed or not allowed for development is about 3,526,254 acres. This alternative would result in a downward trend in permits issued and sales of BLM administered mineral materials.

Alternative C

Under Alternative C about 266,438 acres of BLM administered mineral materials would not be allowed to be developed. An additional 52,350 acres would be closed to mineral material development *under Impacts Common to All Alternatives* for a total of about 318,788 acres which would either be closed or not allowed to be developed for mineral materials. When overlapping restrictions are dissolved (overlaps removed) the total acres closed or not allowed for development is about 302,056 acres.

Alternative D

Under Alternative D about 104,987 acres of BLM administered mineral materials would not be allowed to be developed. An additional 52,350 acres would be closed to mineral material development under *Impacts Common to All Alternatives* for a total of about 157,337 acres which would either be closed or not allowed to be developed for mineral materials. When overlapping restrictions are dissolved (overlaps removed) the total acres closed or not allowed for development is about 143,210 acres.

Alternative E (Proposed)

Under Alternative E about 146,472 acres of BLM administered mineral materials would not be allowed to be developed. An additional 52,350 acres would be closed to mineral material development under *Impacts Common to All Alternatives* for a total of about 198,822 acres which would either be closed or not allowed to be developed for mineral materials. When overlapping restrictions are dissolved (overlaps removed) the total acres closed or not allowed for development is about 168,957 acres.

RECREATION

SUMMARY OF IMPACTS

Recreation management under the alternatives reflects the diversity of visitor demand in the planning area as well as accommodating specific visitor demand which is contingent on restrictions in other BLM management programs. Visitors can also express a very diverse preference for recreation activities. Some management actions under these alternatives could restrict opportunities to participate in these recreational activities. However, closures to one activity could benefit other recreationists when the area is closed to a conflicting activity. The impact analysis will reflect this diverse array of experiences and benefits a recreationist may have within the planning area. Conversely, management objectives for SRMAs specifically target beneficial

outcomes resulting from specific recreation use in that area. Alternative E provides for a more diverse array of SRMAs than Alternative A or D, but less than B or C, which will have beneficial outcomes and experiences for those recreational users within the boundaries of those SRMAs.

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in this impact analysis include the following:

- It is assumed that demand for recreational use of public land would be expected to increase in the future. Increases would be expected in hunting, fishing, hiking, camping, wildlife viewing, and dispersed recreational uses.
- Demand for developed recreation areas would increase. It is expected that in the long-term, 10 to 50 recreational facilities would be developed for additional fishing, picnicking, and camping areas. Each development would disturb 5 to 10 acres while access into each area would disturb an additional 5 to 10 acres.
- The incidence of conflicts between various public user groups involved in motorized and non-motorized activities would increase with increasing use of public lands. Limited resources that are subject to the demands of larger population's stresses both natural resources and the visiting public's social and economic needs. Conflict will not be limited to specific recreationists.
- All areas (SRMAs and ERMAs) will be managed to meet statutory requirements to ensure resource protection, human health and safety, reduce conflicts, and achieve other program planning objectives.
- This analysis compares impacts to the following important recreation areas and existing SRMAs: Powder River Depot SRMA, Calypso SRMA, Lewis and Clark Trail SRMA, Howrey Island ACEC, Matthews Recreation Area, Dean S. Reservoir, Pumpkin Creek, Glendive Short Pine OHV Area, Terry OHV Area, Strawberry Hill Recreation Area, and Moorhead Recreation Area.
- Impact analyses and conclusions are based on interdisciplinary team knowledge of resources and reviews of existing literature, BLM records, and information provided by other agencies and institutions. To analyze the potential impacts of the alternatives on the recreation program, information was gathered from administrative files for recreation in the planning area and other resource programs. The analysis is also based on the MCFO outdoor recreation planner's knowledge of the area and the professional expertise of BLM specialists at the MCFO and the Montana State Office. Impacts are quantified where possible but, in the absence of quantitative data, best professional judgment is used.
- Because the current economy is unpredictable, maintaining current trends in recreation would show no net increase or decrease in current visitor use. Economic health impacts the number of trips, trip duration, and spending patterns while visitor use days depend on economic health and gas prices.

IMPACTS COMMON TO ALL ALTERNATIVES

An important component of recreation is scenic quality, so impacts that diminish or degrade scenic quality through the impacts of smoke, haze, or other air pollutants would potentially impact recreational opportunities that include scenic quality as part of the experience. Air quality actions common to all alternatives would have long-term impacts on recreation by reducing or mitigating potential impacts of prescribed burning through smoke management, timing, and monitoring. Mission reduction measures and prioritization of actions that reduced or mitigated emissions by enhanced energy efficiency, used lower GHG-emitting technologies, and adjusted the timing of BLM activities to accommodate long-term changes in seasonal weather patterns would also assist in reducing pollutants in the air, which would impact the scenic quality for recreational users.

Meeting Montana water quality standards would protect water resources for any new developed recreational sites. Water and watershed management activities would indirectly protect existing flow conditions that affected recreational opportunities and river-related activities.

Vegetative management actions, including riparian and wetland areas and invasive species, would improve recreational settings by meeting Rangeland Health Standards, using locally gathered native seed, and

managing nonnative plant communities. Implementation of a combination of vegetation treatments (including prescribed fire, manual cutting, mechanical removal, root ripping, herbicides, and actions to create healthy stands of hardwood draw communities, and managed herbivore) would displace visitors, a short-term impact to recreational use. Long-term impacts would include improvement of the recreational settings, opportunities, and activities.

Several resource management actions common to all alternatives would impact recreation settings and activities. Standard wildlife and special status species stipulations would limit recreational activities and/or recreation permit holders. These impacts would be seasonal and not permanent closures. These stipulations could limit new recreation developments and visitor services and result in project relocation or modification. Other management actions of threatened and endangered species habitat; predator control; and restoring, enhancing, and maintaining habitats for avian species would improve recreational settings and opportunities. Fish and wildlife management decisions would impact the habitat, health, and population of fish and wildlife species, and many recreational activities (such as hunting, wildlife viewing, bird watching, and fishing) would depend on the presence of healthy and abundant wildlife habitats and populations. Wildlife actions that maintained or improved wildlife habitat would impact the natural integrity of the recreational setting and influence activities and opportunities.

Wildfire and fuels management (prescribed fire) would cause short-term impacts (including temporary closure of areas during and after fire events) that displace recreationists. Although the altered recreational setting would displace some recreationists in the long-term, impacts from these actions would also create new recreational opportunities and experiences. Specific fire management plans that maintained recreational settings and activities would identify and include developed recreation sites and SRMAs.

Protective management actions for cultural resources would impact recreational opportunities by moving or redesigning facilities or rerouting access, which would displace recreationists to other potentially less desirable areas. Standard cultural stipulations could have the same effect as wildlife stipulations and limit new recreation developments and visitor services resulting in project relocation or modification.

Management actions for paleontological resources would avoid impacts to significant paleontological remains through project redesign, project abandonment, or mitigation of impacts, all of which would have a minimal impact on recreational opportunities and settings.

Predator control would be allowed with special design features to achieve recreational goals and objectives. Predator control is anticipated to benefit the recreationist by providing a level of protection to human health and safety and reducing human or animal conflicts with predatory species. If the control method does not meet the recreational goals and objectives of the area, those methods would not be applied.

VRM actions would maintain the overall integrity of the scenic qualities while allowing for the development of existing and future uses. Visual resource designations would limit visual impacts associated with management actions in VRM Class I and Class II areas and allow more modification of the natural environment in VRM Class III and Class IV areas. Mitigation associated with VRM Class I and Class II areas would prevent contrast between projects and existing elements and subsequently retain or improve recreational settings. Ensuring VRM Class I and II objectives are met through allowable use decisions would beneficially impact recreationists who enjoy scenic environments. Mitigation in VRM Class III and Class IV areas would allow a wider range of scenic contrasts, which would detract from the recreational setting. Alteration of this setting would influence recreational activities and displace some recreationists who seek backcountry to middle-country recreational settings.

Allowing harvests of minor wood products to maintain or enhance forest health would provide recreational opportunities (such as wood gathering) and improve recreational settings through the enhancement of scenic qualities and other values. However, altered recreational settings (such as increased traffic, dust, noise, and increased human presence) caused by woody and non-woody biomass removal and salvage of dead and dying timber would temporarily displace recreationists.

Livestock management actions (including fencing) designed to maintain or improve vegetation conditions would enhance recreational opportunities through the maintenance of setting, opportunities, and experiences. Although the presence of livestock may not diminish the experience of some recreationists, other recreationists would be displaced (at a site-specific level) in response to water quality issues and livestock presence depending on visitor preference. Close proximity to livestock and behavioral concerns would influence recreationists' safety, location choice, or overall recreational experience; reduce the quality of the experience; and displace recreationists to other, less satisfactory locations or periods without livestock. The intensity of impact from livestock management actions would depend on the intensity of use resulting from this program. Promoting a shorter duration of livestock use and changing the season of use would reduce impacts to recreation.

Development activities would impact recreation by altering values important for recreation such as scenic quality and natural, social, and administrative settings. The industrialized character associated with oil and gas development, solid material and coal mining and realty activities would introduce new and contrasting elements, impact scenic quality, and displace some recreationists. Recreational settings would be changed to an industrialized landscape setting that impeded recreationists' goals and degraded their experiences. Short-term impacts to recreation from increased development would include expanded recreational opportunities from potentially improved access to previously inaccessible areas. In the long-term, values and resources such as scenic quality, solitude, and wildlife would be degraded and impede recreationists' goals and degrade their experiences.

The recreation program provides opportunities for outdoor recreation activities at both developed sites and dispersed areas. Under Impacts Common to all Alternatives, recreation attractions would be managed to provide for visitor health and safety, protect resources, enhance recreation, and coordinate with other programs to minimize conflicts and impacts to recreation opportunities. Short-term impacts from recreation management actions would preserve or increase visitor satisfaction through the quality of settings, opportunities, and experiences. Long-term impacts would include sustained recreational activity. Continuing to issue special recreation permits on a first-come, first-served basis would continue to allow large, organized recreational activities.

Travel Management and OHV management actions would provide recreational opportunities and activities, protect and mitigate resource damage, and resolve conflicts caused by OHV use. Direct, short-term impacts of OHV use (noise and decreased air quality) would diminish the recreational experience for recreationists seeking solitude and natural settings for camping, hiking, and related non-motorized recreational activities. Conflicts between recreationists, such as motorized and non-motorized users, would detract from the quality of the recreational experience. OHV use would provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing, and access to remote areas.

Eliminating use of firearms, except during the State of Montana's legal upland game bird and waterfowl hunting seasons, would reduce user conflict at the Matthews Recreation Area. Not allowing shooting at any time within the developed area would enhance safety for all users on the 91-acre site.

Management of the Lewis and Clark National Historic Trail and the Big Sky Back Country Byway would occur under all alternatives and continue to manage to enhance visitor experiences would increase recreational opportunities and maintain settings. Special protections and enhancements associated with special designation areas and the Back Country Byway would often enhance recreational settings and experiences, while maintaining dispersed recreation activities. The Big Sky Back Country Byway would be managed to enhance user experience and facilitate public access. Interpretation of the Lewis and Clark National Historic Trail would enhance public enjoyment of these trails and could slightly increase use along the routes. Recreation sites that overlap with the trail would be managed to increase user experience and visual quality.

Lands and realty management actions that considered acquisition of nonfederal lands would improve public access in areas with intermingled land ownership and facilitate increased or improved access to recreation resources such as WSAs, rivers, or SRMAs. Other lands and realty actions (such as major ROWs, improvement of the energy transportation network, and communication site requests) would result in surface disturbance and create contrasting elements on the landscape that influenced recreational activities; possibly

displaced recreationists to alternate areas; and altered recreational settings, opportunities, and activities in the area.

Although special protections and enhancements associated with special designation areas and SRMAs would often enhance recreational settings and experiences, these actions would restrict some recreation management activities and dispersed recreation uses. Under these management actions, ACECs would consist of settings for users seeking primitive or backcountry recreational opportunities. Such opportunities, however, would preclude and displace users seeking motorized activities in most SRMAs (except for the Glendive Short Pines OHV Area).

Special protections and enhancements associated with WSAs would often enhance backcountry and primitive recreation settings and experiences but potentially restrict recreational management activities that motorized users sought. Continued management of WSAs under BLM Manual 6330, *Management of Wilderness Study Areas*, would enhance the primitive and non-motorized recreation opportunities as well as protect wildlife-dependent recreational opportunities.

ALTERNATIVE A (No Action)

Summary Statement

Alternative A provides for resource protection and to protect human health and safety for visitor services. Accommodation of other resource priorities is more of a focus under this alternative than accommodating visitor demand, recreation settings, specific activities or outcomes. There are protections for existing developed recreation sites; however, this alternative does not include protections for new growth and specific settings, experiences and beneficial outcomes. Protections would not enhance or sustain recent developments to the sites. Program management under this alternative would not sustain or enhance the recreation settings of other important recreation areas to supply specific visitor demand for recreational opportunities (activities and outcomes).

Resources

Avoiding or limiting surface-disturbing activities on slopes 30% or greater would preclude the access or development of recreational campgrounds or more developed recreational sites in specific areas, but maintain or enhance the recreational settings and supplemental values for the recreating public.

The use of wildfire to meet multiple resource objectives, when appropriate, would not be allowed unless it falls within management category C, or approximately 310,000 acres. Wildfire would not be allowed to play a natural role in most of the planning area. Impacts to recreation would minor, with some displacement in the long-term and limited new recreational opportunities and experiences.

No protection of wilderness characteristics would occur on dispersed recreational lands. The backcountry and primitive recreational experiences would be decreased by resource use development if it were to occur.

Resource Uses

Authorized uses associated with mineral and energy resource development and realty actions, which would occur in most of the planning area, (including coal, mineral materials and locatable minerals mining, oil, and gas development, rights-of-way and land use leasing) Alternative A would result in the recreation setting trending toward urban/industrial. Many of these actions would be localized, random, differ in scale and associated with existing disturbance; that may not alter the recreation setting. However, new disturbances would adversely impact recreationists seeking to recreate in areas with low road density, high degree of naturalness, and few people. Conversely, these impacts would benefit recreationists who enjoy recreating in a motorized/high road density environment with numerous human disturbances and other users.

Managing forestlands for the enhancement of other resources would cause long-term impacts by improving forest health that enhanced the recreational settings and values. Allowing wood product sales for post and

poles, Christmas trees, and firewood within specific areas would benefit recreation specific to those activities but displace recreationists seeking solitude.

Livestock grazing systems and range improvements would be implemented to enhance wildlife, watershed, and riparian values. These systems and improvements would enhance recreational settings by improving water quality and wildlife habitat. Livestock management actions designed to maintain or improve vegetation conditions would enhance recreational opportunities through the maintenance of setting, opportunities, and experiences. Although the presence of livestock may not diminish the experience of some recreationists, others would be displaced (at a site-specific level) in response to water quality issues and livestock presence. Close proximity to livestock and behavioral concerns would influence recreationists' safety, location choice, or overall recreational experience; reduce the quality of the experience; and displace recreationists to other, less satisfactory locations or periods without livestock. Promoting a shorter duration of livestock use and changing the season of use would consider recreation timing to reduce the impacts on recreation.

Travel Management and OHV actions that prohibited off-road travel for big game retrieval would protect the recreational setting from route proliferation but also reduce accessibility and opportunities for big game retrieval for some recreationists. Under this alternative, approximately 2,400 acres would be Open OHV use, 2.7 million Limited and 80 acres Closed.

The Glendive Short Pine OHV area and the Terry OHV area would be managed as focus areas for OHV (motorized) trail use, with use limited in some areas to designated trails. The impacts on recreation resources would be minor in the long-term because the area is currently managed for OHV motorized trail use with surface disturbances in the open area and limited to designated routes in some areas. Management that promotes this kind of activity would result in long-term impacts on motorized and specialized-motorized users.

Glendive Short Pine OHV area's designated shooting area would continue to remain open under this alternative, which would allow recreationists who use this area to continue use. However, it would decrease safety to OHV users and other recreationists in the area.

Management of the Lewis and Clark National Historic Trail under this alternative would increase recreation opportunities and maintain settings. The SRMA management goals would be to provide scenic overlook facilities to enhance the visitor experience, provide quality camping experiences for users, and provide hiking and backpacking opportunities. The long-term impacts to recreational users under this alternative would reduce the likelihood of resource use conflicts and increase the likelihood of satisfying experiences for non-mechanized use along the trail.

Special Designations

Although special protections and enhancements associated with special designation areas, SRMAs, and WSAs would often enhance recreational settings and experiences, these actions would restrict some recreation management activities and dispersed recreation uses. Under these management actions, ACECs would consist of settings for users seeking primitive or backcountry recreational opportunities. WSAs, managed to preserve wilderness character, would consist of settings for users seeking primitive recreational opportunities. Such opportunities, however, would preclude and displace users seeking motorized activities.

ALTERNATIVE B

Summary Statement

With restrictions under this alternative, visitor experiences would be enhanced and more opportunities created for recreationists. RMIS data showed an approximately 13-percent increase in visitor use days for the last 5 years. Alternative B manages eleven recreation areas as SRMAs for 43,869 acres. In SRMAs the recreation setting is managed to meet visitor demand for specific activities, experiences and benefits. Under this alternative, management actions for other resource programs are beneficial in enhancing the recreation setting and ensure future recreational enjoyment for nine of these SRMAs. For the Glendive and Terry OHV

SRMAs, the user is looking for a different experience and outcome, in which the additional restrictions would be considered an impact to the motorized user as it could limit their activity. Program management in Alternative B would protect more existing developed recreation sites than Alternative A. In addition, the alternative would protect future developed sites and investments.

Resources

Although limiting surface-disturbing activities on sensitive soils or badland and rock outcrops would prevent the development of recreational campgrounds or more developed recreational sites in specific areas, these actions would maintain, enhance, or increase the recreational settings and supplemental values through an unaltered landscape, which would allow for a more natural and primitive recreation experience. Stipulations for resources could conflict with recreation settings and opportunities in important recreation areas.

Avoiding or not allowing surface-disturbing activities that would not benefit waterbodies, streams, floodplains or riparian areas would protect recreational water-based activities and maintain or improve recreational settings and values on river-related activities. This action would preclude some development of recreational sites near water-based activities.

Prohibiting surface-disturbing or disruptive activities within 0.5 miles of pallid sturgeon habitat would preclude development or maintenance of recreation areas or developed recreation sites, which would reduce the value of the recreational setting and create an unsafe environment for recreationists.

Use of wildfire (unplanned ignitions) to meet multiple objectives, when appropriate, would allow wildfire to play its natural role in the planning area, displacing some recreationists in the long-term, however impacts would create new recreational opportunities and experiences. Prescribed fire could occur more frequently in the SRMAs, which would potentially alter the recreation experiences through smoke and poor air quality. These impacts would be temporary and would potentially be mitigated or minimized with respect to timing, location, and methods used. Reducing the potential for future large-scale wildfires would benefit recreation opportunities and experience levels over the long-term.

Managing non-WSA lands with wilderness characteristics on 28,841 acres would enhance recreational settings and experiences for users seeking primitive or backcountry recreational opportunities. Such opportunities however, would preclude and displace users seeking motorized activities.

Resource Uses

Impacts for new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A. However due to the level of resource restrictions on development, the overall impacts are much less those of Alternative A.

Eliminating management of forestlands for forest products would reduce forest health but reduce the short-term displacement of recreationists and potential conflicts between recreationists and commercial timber activities, which would allow for a more primitive recreational experience. Improved forest health would benefit recreational settings and values and influence overall recreational opportunities. However, as the forest declined in health, impacts to game populations would impact recreational experiences. Declining forest health would also impact visual values and settings. Prohibiting wood product sales for post and poles, Christmas trees, and firewood would displace recreationists who seek those activities.

Impacts from livestock grazing management actions would be similar to those described under Alternative A (except fewer acres would be open to grazing under this alternative). Compared to alternative A, since there are fewer acres available for grazing, this would increase visitor demand and enticement across the planning area.

Under this alternative, zero acres would be designated Open OHV use, 2.79 million Limited and 63,841 acres Closed. This would adversely impact recreationists who seek to recreate in areas with low road densities.

Conversely, these impacts would beneficially impact recreationists who enjoy recreating in a motorized/high road density environment with human disturbances and other motorized users.

Travel Management and OHV actions that prohibited off-road travel for big game retrieval would protect the recreational setting from route proliferation; however, such actions would also impact accessibility and opportunities for big game retrieval for some recreationists.

Prohibiting surface-disturbing or disruptive activities within 0.5 miles of sport fish reservoirs would preclude development or maintenance of recreation areas or developed recreation sites unless there was a benefit to the aquatic wildlife habitat. This would reduce the value of the recreational setting and create an unsafe environment for recreationists that utilize recreation facilities. However, this alternative would enhance recreational settings and experiences for users seeking a primitive recreational opportunity.

Prohibiting special recreation permits on BLM-administered land would reduce user conflicts between the permittee holder and the general public during permitted use. For some recreationists, this action would impact their recreational value and experiences (by eliminating conflict) and increase opportunities for certain activities such as harvesting big game. However, this action would reduce acres of public land available for recreationists and other users who may use guide and outfitter services or other activities needing a special recreation permit.

Under this alternative all recreation areas would be designated as SRMAs. This would enhance specific recreation settings of most of the important recreation areas. This alternative would facilitate enhancement of important recreation areas and would meet visitor demands. Management would focus more on providing specific recreation opportunities, activities, experiences, and benefits.

Under this alternative, the Lewis and Clark Trail SRMA boundary would be modified to include 0.5 miles on each side of the trail and provide more protection for recreation resources within that boundary. This action would increase the recreational experiences within the SRMA and reduce the possibility of development adjacent to the river that affected river recreation experiences and visual resources.

Designating the Glendive Short Pine OHV Area a SRMA and modifying the OHV boundary (dropping 339 acres from OHV use) would not detract from visitor experience or enjoyment. The OHV area was reduced in size due to the 339 acres not having legal public access. Restricting OHV use to existing roads and trails on the remaining 2,753 acres would reduce user conflicts between motorized and non-motorized users. While the area would no longer be designated Open, the majority of roads and trails in use would remain open for motorized users. However, this action would relocate some recreationists to other Open areas and increase trails on adjacent or nearby public land. The designated shooting area would be closed and use of any firearms would be restricted except during the State of Montana’s legal hunting seasons, which would increase safety to OHV users and other recreationists. It would displace some recreationists who use the shooting range to nearby public land that is open for target shooting.

Designating the Terry OHV Area a SRMA and limiting OHV use to existing roads and trails would reduce user conflicts between motorized and non-motorized users. While the area would no longer be designated Open, the majority of roads and trails in use would remain open for motorized users. This action would relocate some recreationists to other Open areas and increase trails on adjacent or nearby public land.

Special Designations

Because ACEC designations protect relevant and important resources, impacts to recreation from the designation of ACECs are similar to other resource impacts and would enhance recreation settings across the planning area. Impacts to recreation from management of those special designations would also limit development and facilitate in a diversity of recreational opportunities.

ALTERNATIVE C

Summary Statement

Alternative C would enhance economic development and visitor experiences and create opportunities for recreationists. As in Alternative B, RMIS data showed an approximately 13-percent increase in visitor use day for the last 5 years. Because of changing economic conditions and fewer restrictions than Alternative B, a 3-percent net increase was used for visitor use days.

Resources

Impacts to surface-disturbing activities on sensitive soils or badland and rock outcrops are the same as Alternative B.

Impacts to waterbodies, streams, floodplains or riparian areas are similar to those of Alternative B.

Impacts to pallid sturgeon habitat are the same as Alternative B.

Wildfire and fuels management impacts to Recreation are the same as Alternative B.

Managing non-WSA lands with wilderness characteristics on 5,236 acres would enhance recreational settings and experiences for users seeking primitive or backcountry recreational opportunities. Such opportunities, however, would preclude and displace users seeking motorized activities.

Resource Uses

Impacts for new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A. However due to the level of resource restrictions on development, the overall impacts are much less those of Alternative A.

Managing forestlands for a diversity of forest product production and resource enhancement would have long-term impacts to recreation, provide for improvements in forest health, and subsequently enhance recreational settings and values. Allowing wood product sales for post and poles, Christmas trees, and firewood within specific areas (in support of forest health and while meeting management objectives) would benefit recreation specific to those activities. Recreationists seeking solitude would be displaced by chainsaw noise.

Impacts from livestock grazing management actions would be similar to those described under Alternative A. Under Alternative C, OHV management actions administering off-road travel for big game retrieval would allow access and opportunity for big game retrieval for recreationists who may not otherwise be able to participate. However, this action would also alter existing settings and decrease values and resources for other recreationists who seek primitive recreation experiences.

Prohibiting surface-disturbing or disruptive activities within 0.25 miles of sport fish reservoirs would preclude development or maintenance of recreation areas or developed recreation sites unless there was a benefit to the aquatic wildlife habitat. This would increase protection for most species and associated habitat and benefit recreational settings and opportunities.

Allowing special recreation permits on BLM-administered surface acres on a case-by-case basis would reduce user conflicts between outfitters and the general public (depending on the type of permit). For some recreationists, this action would decrease their recreational value and experiences by increasing use in a specific area. However, this action would reduce conflicts between permitted uses already in existence. Criteria would be set up and monitored for any change in conditions, such as changes in data from MFWP or the Board of Outfitting, habitat and wildlife needs, number of recreationists, law enforcement citations, private landowner concerns, or other indicators. Future variables involved with the special recreation

permitting process would be monitored for specific criteria and new and renewal permits would be modified according to data collected through stipulations or limitations.

Under this alternative, 640 acres would be designated Open OHV use, 2.79 million Limited, and 550 acres Closed. Conflicts between various recreationists (such as motorized users and non-motorized users) would detract from the quality of the recreational experience. OHV use would provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing and access to remote areas.

All recreation areas would be designated as SRMAs with impacts similar to Alternative B.

Impacts to the Lewis and Clark Trail SRMA are the same as Alternative B.

Making a portion of the Glendive Short Pine OHV Area unavailable (except for vegetation management activities), consisting of 330 acres, to livestock grazing would impact recreation in the planning area. Although livestock presence in a landscape setting may not diminish the experience of some recreationists, other recreationists would be displaced (at a site-specific level) in response to water quality issues and the presence of livestock. Close proximity to livestock and behavioral concerns would influence recreationists' safety, location choice, or overall recreational experience; reduce the quality of the experience; and displace recreationists to other, less satisfactory locations or periods without livestock. This management action would also reduce user conflicts between motorized users and livestock.

Modifying the Glendive Short Pine OHV boundary and dropping approximately 339 acres from OHV use would not reduce visitor experiences or enjoyment because the area is rarely used by motorized users (the reduction is the same as Alternative B). OHV use would be designated Open on approximately 640 acres and restricted to existing roads and trails on the remaining 2,091 acres, which would reduce user conflicts between motorized and non-motorized users. While the entire area would no longer be designated Open, the majority of roads and trails in use and a portion of the area would remain open for motorized users. The Glendive Short Pine OHV area's designated shooting range would continue to remain open, which would allow recreationists who currently use this area to continue use. However, it would decrease safety to OHV users and other recreationists within the area.

Designating the Terry OHV Area a SRMA, and limiting OHV use to existing roads and trails would reduce user conflicts between motorized and non-motorized users. While the entire area would no longer be designated Open, the majority of roads and trails in use would remain Open for motorized users. However, this action would displace some recreationists to other Open areas and increase trails on adjacent or nearby public land.

Special Designations

Impacts from special designations would be similar to Alternative A, but would provide secondary impacts to recreation from management actions with designation of ACECs. The ACECs would provide more resource protections that would enhance the recreation settings for recreation opportunities.

ALTERNATIVE D

Summary Statement

By allowing more resource development, Alternative D would decrease recreational experiences, which would also decrease recreational use. Data from RMIS showed a 13-percent increase in visitor use days for the last 5 years. Using these data, a net decrease of 6 percent was used. Alternative D focuses on accommodating priorities of other BLM programs rather than visitor demand.

Resources

Impacts to surface-disturbing activities on sensitive soils or badland and rock outcrops are the same as Alternative B.

Impacts to floodplains or riparian areas are similar to those of Alternative B.

Water resources management actions that allowed surface-disturbing activities with approved mitigation would maintain or improve recreational settings and values for river-related activities. Recreational development would be allowed with mitigation measures, which would improve the setting for recreationists.

Surface-disturbing or disruptive activities are allowed within 0.5 miles of pallid sturgeon habitat as long as they maintain the habitat functionality. This action would preclude some development of water-based recreational sites or activities; however some development could occur providing limited opportunities.

Wildfire and fuels management impacts to Recreation are the same as Alternative B.

Impacts to land with wilderness characteristics would be the same as Alternative A.

Resource Uses

The impacts and level of new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A.

Impacts to managing forestlands for a diversity of forest product production and resource enhancement would be similar to those described under Alternative C.

Impacts from livestock grazing management actions would be similar to those described under Alternative C.

Under Alternative D, management actions pertaining to off-road travel for big game retrieval would allow access and opportunity for big game retrieval for all recreationists. However, this action would also alter existing settings and decrease values and resources for other recreationists (those who hike or prefer primitive experiences). Route proliferation would intensify with increased off-road retrieval of big game.

Under this alternative, 1,972 acres would be designated Open OHV use, 2.79 million Limited, and zero acres Closed. Conflicts between various recreationists (such as motorized users and non-motorized users) would detract from the quality of the recreational experience. OHV use would provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing, and access to remote areas.

Allowing surface-disturbing and disruptive activities near designated sport-fish reservoirs with specialized design features could decrease protection of these sites and reduce recreational settings and opportunities. However, these management actions would improve opportunities for recreational management projects. Prohibiting livestock grazing when the activity would be incompatible with recreational activities would increase recreationists' sense of safety and the quality of recreational experience at sport-fish reservoirs. Impacts from special recreation permitting are the same as Alternative C.

Under this alternative all recreation areas would be designated as ERMAs. This would not enhance specific recreation settings of most of the important recreation areas, but focuses instead on maintaining an existing environment. This alternative would not facilitate enhancement of important recreation areas and would meet a less specific visitor demand. Management would focus more on providing a diversity of recreation opportunities, vs. specific activities, experiences, and benefits.

Under this alternative, Glendive Short Pine OHV Area would be managed as an ERMA with Open OHV use on 1,900 acres and Limited OHV use on 810 acres. Modifying the Glendive Short Pine OHV area boundary by approximately 300 acres would still provide recreational opportunities and activities for motorized users

(the reduction is the same as Alternative B). Direct, short-term impacts of OHV use (noise and decreased air quality) would diminish the recreational experience for other dispersed recreational users (such as campers and hikers). Conflicts between the congested OHV area and livestock grazing would detract from the quality of the recreational experience. Increased conflict would occur on the 810 acres that is now a limited OHV area designation as the motorized user could not leave the trail to go around cattle on the trail. OHV on open areas would continue to provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing, and access to remote areas. The Glendive Short Pine OHV area's designated shooting range would continue to remain open, which would allow recreationists who currently use this area to continue use. However, it would decrease safety to OHV users and other recreationists within the area.

Managing the Terry OHV Area as an ERMA with Open OHV use on 72 acres would provide recreational opportunities and activities for motorized users. Direct, short-term impacts of OHV use (noise and decreased air quality) would diminish the recreational experience for other dispersed recreational uses such as camping and hiking. Conflicts between the congested OHV area and livestock grazing activities would detract from the quality of the recreational experience. OHV use would provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing, and access to remote areas.

Special Designations

Impacts from special designations would be similar to Alternative C.

ALTERNATIVE E (Proposed)

Summary Statement

Alternative E would enhance economic development and visitor experiences and create opportunities for recreationists in an environmentally sustainable manner. RMIS data from the last 5 years showed an approximately 13 percent increase in visitor use days. Because of changing economic conditions and fewer restrictions than Alternative B, a 3-percent net increase was used for visitor use days. Alternative E would balance current management while incorporating this increase in visitor use days, which would enhance recreationist's benefits and experiences within recreation sites.

Alternative E is responsive to visitor demands and increases (more than alternative A but less than Alternative B or C) visitor services in most important recreation areas and provides for management actions that ensure the future recreational enjoyment of these areas. Alternative E manages eight areas as SRMAs where the recreation setting is managed to meet visitor demands for specific activities, experiences, and benefits. Management actions are specifically developed to sustain and/or enhance the entire recreation setting.

Under Alternative E, SRPs would only be issued on a case-by-case basis for hunting outfitter and guides in core areas that would not adversely impact publically accessible, high impact recreational areas. Only one permit for hunting outfitter and guides would be allowed on any given parcel of BLM administered public land.

Resources

Impacts to surface-disturbing activities on sensitive soils or badland and rock outcrops are the same as Alternative B.

Impacts to recreation from waterbodies, streams, floodplains or riparian areas are similar to those of Alternatives B and D.

Surface-disturbing or disruptive activities are allowed within 0.25 miles of pallid sturgeon habitat as long as they maintain the habitat functionality. This action would preclude some development of water-based recreational sites or activities; however some development could occur providing limited opportunities. Wildfire and fuels management impacts to Recreation are the same as Alternative B.

Impacts to managing non-WSA lands with wilderness characteristics on 5,236 acres are the same as Alternative C.

Resource Uses

The impacts and level of new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A. However, the level of development or surface disturbance in sensitive resource areas would be limited.

Impacts to managing forestlands for a diversity of forest product production and resource enhancement would be similar to those described under Alternative C.

Impacts from livestock grazing management actions would be similar to those described under Alternative C.

Travel Management and OHV actions that prohibited off-road travel for big game retrieval would protect the recreational setting from route proliferation but also reduce accessibility and opportunities for big game retrieval for some recreationists.

Under this alternative, 0 acres would be designated Open OHV use, 2.7 million Limited and 2,800 acres Closed. Conflicts between various recreationists (such as motorized users and non-motorized users) would detract from the quality of the recreational experience. OHV use would provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing, and access to remote areas.

Impacts from actions that are near designated sport-fish reservoirs are the same as Alternative D.

Management of special recreation use permits for commercial, competitive, and special events would continue to be considered on a case-by-case basis with priority given to existing permittees. New permits that conflicted with existing permit uses would not be issued. Allowing special recreation permits on BLM-administered surface acres as appropriate for commercial, competitive, and special events would reduce user conflicts between outfitters and the general public (depending on the type of permit). For some recreationists, this action would decrease their recreational value and experiences by increasing use in a specific area. However, this action would reduce conflicts between permitted uses already in existence. Criteria would be set up and monitored for any change in conditions, such as changes in data from MFWP or the Board of Outfitting, habitat and wildlife needs, number of recreationists, law enforcement citations, private landowner concerns, or other indicators. Future variables involved with the special recreation permitting process would be monitored for specific criteria and new and renewal permits would be modified according to data collected through stipulations or limitations.
SRPs for hunting outfitter and guides would only be issued on a case-by-case basis throughout the planning area subject to environmental, social, and public health and safety concerns. SRPs would not be authorized or renewed that conflict with other BLM permitted uses and BLM Special Designation Areas or Recreation Area objectives. This would be beneficial to the general recreationist who hunts public land but would be an adverse impact to the hunting outfitter. Only one permit for hunting outfitter and guides would be allowed on any given parcel of BLM administered public land. For the outfitter with the permit this is a beneficial impact, conversely, other outfitters needing to make a profit this could be an adverse impact.

Impacts to recreation from SRMA designations are the same as Alternative B on Calypso SRMA, Lewis and Clark Trail SRMA, Howrey Island ACEC, Matthews Recreation Area, Dean S. Reservoir, , Glendive Short Pine OHV Area, Strawberry Hill Recreation Area, and Moorhead Recreation Area.

The Powder River Depot would not be designated a SRMA, rather it falls within the Lewis and Clark SRMA and would be managed accordingly.

Impacts to the Lewis and Clark Trail SRMA are the same as Alternative B.

Closing OHV use on the east side of the walking trail at Howrey Island would reduce user conflicts between motorized and non-motorized users but would displace some recreationists who rely on travel to the east portion by vehicle.

The Glendive Short Pine OHV Area would be modified from "Open" to "restricted to existing roads and trails". The OHV area was reduced in size due to manageability of the area. A portion of the area (339 acres) does not have legal public access and the public lands in Section 12 have limited access which results in trespass on the adjacent private lands. Restricting OHV use to existing roads and trails on the remaining 2,272 acres would reduce user conflicts between motorized and non-motorized users (Map 13). While the area would no longer be designated Open, the majority of roads and trails in use would remain open for motorized users. This action could relocate recreationists to other Open areas and potentially increase trails on adjacent or nearby public land. Closing the designated shooting area and restricting the use of any firearms (except during the State of Montana's legal hunting seasons) would increase safety to OHV users and other recreationists but displace some recreationists who use the shooting range.

The Terry OHV Area would not be designated as a SRMA or ERMA, rather public lands not designated as a recreation management area. Designating the Terry OHV Area as Public Lands Not Designated as Recreation Management Areas would not alter the recreational use of this area. The area would no longer be designated "Open", rather a limited OHV area designation. Impacts from this modification are expected to be similar as those of the Glendive Short Pine OHV Area and in Alternative D.

The Pumpkin Creek area would be designated as an ERMA on the north and east of Highway 59 (approximately 2,200 acres) and the remainder of the lands would be managed as public land not designated (approximately 19,006 acres). The ERMA and not designated lands would not enhance specific recreation settings, but focus on maintaining the existing environment. These designations would not facilitate enhancement of the Pumpkin Creek area for recreation purposes or specific activities, experiences, and benefits. The ERMA would focus management to provide a diversity of recreation opportunities; while the portion not designated as a recreation management area would meet basic recreation and visitor services.

Special Designations

Although special protections and enhancements associated with special designation areas, SRMAs, and WSAs would often enhance recreational settings and experiences, these actions would restrict some recreation management activities and dispersed recreation uses. Under these management actions, ACECs would consist of settings for users seeking primitive or backcountry recreational opportunities. WSAs, managed to preserve wilderness character, would consist of settings for users seeking primitive recreational opportunities. Such opportunities, however, would preclude and displace users seeking motorized activities.

CUMULATIVE IMPACTS

Cumulative impacts to recreation would result from BLM actions that authorized surface disturbance and disruptive activities in combination with similar activities on private and state lands. These impacts would result primarily from oil, gas, or wind power developments that reduced the quality of most recreational settings and experiences through increased improved roads, night lighting, industrial traffic, noise, and visual resource degradation through industrial development. Creation of additional improved roads in areas that historically contained only primitive vehicle routes would detract from the middle country experience preferred by those recreationists in the region desiring that type of setting. Because mitigation is not required when developing private lands, impacts on private lands may be much more severe than impacts occurring on federal lands. For example, facilities may be brightly colored or located prominently on ridgelines, roads may be poorly designed, or pad sizes may be larger than would be desirable. All of these impacts would detract from the quality of the recreational setting, and this kind of development would cause long-term reductions in the quality of recreational experiences available and reduce recreation use in these areas. Additionally, the risk of traffic accidents would increase as development progressed and additional roads were created, particularly when hunters were added to the industrial traffic on the primary access roads. This impact is more adverse within this planning area due to the scattered land pattern of public and private land located throughout the field office.

Although the impacts of mineral development on recreation were discussed throughout the RMP, it is important to note that recreation use would not occur equally within the planning area. Recreation use is generally highest in areas closer to local towns or communities. The impacts of minerals development to recreation are higher in areas receiving high recreation use, and lower in areas receiving less recreation use. The majority of impacts upon recreation users from mineral development would remain whether or not the area was managed as a SRMA because SRMAs, for the most part, would not restrict mineral development. Since the projected levels of mineral development would not be likely to impact current levels of recreation use, this use would most likely continue to occur (or increase) regardless of management direction.

Block management areas, in which MFWP provides for public hunting access, provide additional public access across a landscape with a checkerboard-ownership pattern by allowing access to private and public lands that otherwise have no legal public access. This program helps reduce hunter concentrations on blocked federal lands, which are preferred by many hunters because landowner permission is not required. Hunters displaced by oil and gas development may increase their use of block management areas containing less development.

In the planning area, the Custer National Forest (the Ashland and Sioux ranger districts) has completed travel management planning opportunities and provides alternative recreational settings for recreationists displaced from BLM-administered land by oil and gas development or other reasons.

Increased recreational demand for dispersed recreational opportunities would conflict with approved land uses, such as development activities that altered recreational settings. Recreational experiences would be degraded by increased visual impacts, noise, dust, industrial traffic, and public health and safety hazards. Displacement or loss of game animals would diminish hunting opportunities in developed areas, and restrictions such as road closures would reduce recreational access in some areas. Although short-term impacts would impact all recreationists as management activities occurred, long-term impacts would improve most recreational activities (such as hunting, camping, fishing, and wildlife viewing). Overall, although net impacts for recreational visitation days would be maintained, impacts may not be able to keep up with increased public use.

Special recreation permits for outfitter and guides would be monitored to determine any conflicts that may arise between the general public and outfitters. This data would determine a possible change in permit numbers or additional stipulations.

Outdoor recreation is dependent on the natural resource base and weather for the quality experiences recreationist's desire. Climate creates opportunities and limitations for outdoor recreation. Higher temperatures could result in increased opportunities for warm season activities for a longer portion of the year (fall and winter) in the planning area, such as swimming or river-related recreation. However, a decrease in the quantity of water and quality of the resource would reduce swimming or fishing. Decreased opportunities for warm season activities could also happen during the hottest part of the year from higher heat, forest fires, low water levels, or reduced air quality caused by climate changes to the natural resource base. Decreased snowpack could result in reduced opportunities and length of time available for cold season recreation activities such as sledding or snowmobiling. Vegetation changes resulting in movement of wildlife could affect hunting and wildlife viewing, and hunting activities could shift with the any shift in wildlife. The extent of the potential impacts is highly dependent on the type of activity and the climate change that occurs.

The extent of the potential impacts is highly dependent on the type of activity and on the climate change that occurs.

Alternative A (No Action)

Alternative A would maintain current trends in recreation, with no net increase or decrease in recreational use. Fish- and wildlife-related recreational experiences (such as hunting) would account for approximately 67 percent of all visits within the planning area while other recreational opportunities would remain at approximately 33 percent.

Increased recreational demand for dispersed recreational opportunities would conflict with approved land uses, such as development activities that altered recreational settings. However, reducing acreage available to mineral development and surface-disturbing activities would increase resource protection under this alternative. Minerals management actions would cause long-term elimination of recreation in oil and gas development areas. However, most of the impacts identified under this alternative would improve the quality of recreational settings.

Impacts to most recreational activities would improve net impacts on typical recreational activities within the planning area, primarily through increased use restrictions. Management actions would increase protections for fish and wildlife habitat, which would enhance the recreational settings and recreational opportunities related to these resources (activities that account for approximately two-thirds of the recreation activities in the planning area and which include fishing, hunting, and wildlife viewing). This alternative would increase recreational activities by an overall 6 percent (generally, visitation would continue to increase but economic impacts would cause a decrease of one-half of normal).

Most programs would increase in overall net recreational use as result of maintenance or improvement of recreational settings within the planning area. Some management actions would impact activities such as campground development and displace campers who desire a rural setting. Reductions and timing restrictions in livestock grazing would reduce conflicts between motorized recreationists and livestock, which would allow a cumulative net increase in recreation use within these areas. The overall net increase in recreation use would be approximately 3 percent (although this reflects an increase, economic impacts would cause a decrease of three-quarters of normal).

Decreases in protective measures under this alternative would reduce fish and wildlife habitat and subsequently alter fish and wildlife-related activities (such as hunting and fishing) recreational settings, opportunities, and experiences in developed areas, the impacts of which would displace recreationists to alternative areas.

The loss of natural recreational settings to oil and gas development would displace recreationists seeking a natural landscape setting and eliminate recreational use in a large area over the long-term. The net impact would reduce activities for hunting, fishing, and wildlife viewing, all of which account for approximately 65 percent of the recreational activities within the planning area. Overall, there would be a net loss of 6 percent in visitor use days.

Alternative B

Under Alternative B, increased recreational demand for dispersed recreational opportunities would conflict with approved land uses, such as development activities that altered recreational settings. However, because fewer acres would be available for mineral development and surface-disturbing activities, resource protection would increase under this alternative. Impacts identified under this alternative would improve the quality of recreational settings, benefits, and experiences.

Impacts to most recreational activities would improve net impacts on typical recreational activities within the planning area, primarily through increased use restrictions. Management actions under this alternative would increase protections for fish and wildlife habitat, which would enhance recreational settings and opportunities related to fish and wildlife activities (activities that account for approximately two-thirds of the recreation activities in the planning area and which include fishing, hunting, and wildlife viewing).

Alternative C

Under Alternative C, most programs would increase in overall net recreational use through maintenance or improvement of recreational settings within the planning area, however, this increase would be less than in Alternative B. Some management actions would impact activities, such as campground development, and displace campers who desire a rural setting.

Alternative D

A decrease in protective measures under Alternative D would reduce fish and wildlife habitat, which would alter fish- and wildlife-related activities (such as hunting and fishing), recreational settings, opportunities, and experiences in developed areas. The impacts of these actions would displace recreationists to alternative areas.

Increased demand for dispersed recreational opportunities under Alternative D would conflict with approved land uses, such as development activities that would alter recreational settings. Recreational experiences would be degraded by increased visual impacts, noise, dust, industrial traffic, and public health and safety hazards under this alternative. Displacement or loss of game animals would diminish hunting opportunities. Restrictions such as road closures would reduce recreational access in some areas.

The loss of natural recreational settings through oil and gas development would displace recreationists seeking a natural landscape setting, which would eliminate recreational use in a large area over the long-term. The net impact would reduce activities for hunting, fishing, and wildlife viewing, activities that account for approximately two-thirds of the recreational activities within the planning area.

Alternative E (Proposed)

Under Alternative E, most programs would increase in overall net recreational through maintenance or improvement of recreational settings within the planning area. Some management actions would impact activities, such as campground development, and displace campers who desire a rural setting. Specific site fees at developed sites may be charged in the future to accommodate visitor needs who desire more services. Fees gathered at these sites will stay on site providing the more facility managed experiences many visitors prefer especially families with young children or senior populations. Charging fees may prohibit lesser economic advantaged individuals from using the developed sites and focus their activities to dispersed and non-maintained recreational areas.

Impacts to most recreational activities under this alternative would improve net impacts on typical recreational activities within the planning area, primarily through increased use restrictions and SRMA designation. The increases in satisfactory recreational experiences by non-motorized users, such as hikers, mountain bikers, hunters, and fishing publics, may result in more returns to the MCFO managed areas because the increase in SRMAs under Alternative E, compared to Alternative A or D, provides more family outings and experiences with diversified activities in one location. Thus, this alternative prevents traveling long distances and saves nearby community's money and time by the SRMAs planned and balanced recreational activities. Those nearby communities would benefit from this due to the increase in demand for the site as well as being able to effectively addressing visitor health and safety, use and user conflict and resource protection issues by creating a possible fee site. Funding and staff would be directed towards the increased use within these areas, which would assist in maintaining settings.

Although it is not certain how much money each user group contributes on a daily basis in the MCFO area, it is possible that local government revenue from hotel, restaurant, and sales tax would be increased under Alternative D should SRMA and OHV use be emphasized as stated in this plan. The fiscal resources of local governments would potentially be indirectly impacted by an increase in recreational visits to the county, as the local and state-level leisure and hospitality tax revenues would increase. Impacts of Alternative D to local employment would be similar to those of Alternative B and C but in slightly lesser acreage due to fewer SRMAs.

The number of individuals allowed per SRP is restricted under Alternative E. Changes in demand for special recreation permits and resulting impacts would be monitored and future thresholds identified that could lead to limits in the number of permits to minimize impacts to the resource, public safety, and overall visitor satisfaction. In turn, this would decrease commercial local activity for guiding activities and may decrease local revenue and opportunities for more public to participate in guided permits. The customer satisfaction by having fewer commercial participants interfering with their guided activity is one of the main recreational benefits under this alternative.

Alternative E emphasizes a balance of recreational opportunities for motorized and nonmotorized uses within the MCFO. Groups or individuals who value solitude and non-motorized activities would have the greatest number of focus areas emphasizing a range of recreational opportunities. This alternative also promotes the greatest amount of motorized backcountry touring on designated routes, but not limiting the motorized experience to those who would like to recreate in traveling activities and participate at the same time in related camping, hunting and fishing during this balanced approach. Under Alternative E, recreation facility development would be aimed at achieving the SRMA's desired recreation setting characteristics, either primitive or developed. If regional populations grow, any new or proposed future SRMAs, especially those near communities, would not likely be able to maintain the desired social recreation setting characteristics through the life of the RMP.

TRAVEL MANAGEMENT AND OHV

SUMMARY OF IMPACTS

This program is considered a support function for all BLM programs. Therefore, some of the objectives of the travel management and off-highway vehicle use program include: to provide and improve sustainable access for public needs and experiences; protect natural resources and settings; and to minimize conflicts among the various users of BLM administered lands. As a result of these broad ranges of objectives for the planning area, impacts to travel management cannot be completely labeled as adverse or beneficial; instead impacts to travel management represent a given area where travel management is a focus or priority and an inventory and plan has been or will be completed. The BLM will follow BLM 1626 – *Travel and Transportation Manual* to complete Comprehensive Travel and Transportation Management Planning for specific areas within the field office.

ASSUMPTIONS AND METHODOLOGY

This section analyzes potential impacts to public access and travel from management actions and allowable uses under the various programs. Travel designations support resource management programs and are designed to help achieve other program objectives. The land use emphasis for each area will help guide future travel management planning designations. Impacts to other resources and resource uses from travel management and OHV use are addressed in resource specific sections of this chapter.

Methods and assumptions used in this impact analysis include the following:

- There are minimal impacts to travel management. Travel management is prepared in response to competing demands for resource uses or protection. Travel management proposals and subsequent decisions are influenced the most by demands for administrative or recreational uses, to provide access for resource uses, and to mitigate wildlife management concerns. Certain areas or roads might also be closed, rerouted, or otherwise managed to accomplish a resource objective, such as a reduction in soil erosion or residual impacts (e.g., contributions to stream sedimentation or actions affecting fisheries).
- Within the planning area, annual ATV and motorcycle user numbers would be expected to rise to 20,000 by 2015 based on an average 20 percent increase each year.
- The demand to increase travel routes on BLM administered lands will continue to increase throughout the planning period, especially near communities.
- The incidence of resource damage and conflicts among mechanized, motorized, and non-motorized activities would increase with increasing use of BLM administered lands.

IMPACTS COMMON TO ALL ALTERNATIVES

Existing air quality rules and regulations, including participation in air quality monitoring programs and consideration for use of emission reduction BMPs during project-level planning, would cause minor and short-term impacts to Travel Management and OHV along unpaved travel routes that required road surfacing related dust abatement measures because travelers would potentially experience some travel delays or re-routing

around the affected road sections during any mitigation or maintenance project. This could be an adverse impact due to the fact the majority of roads in the planning area are not paved and consist of un-graveled dirt roads.

Soil management actions that used BMPs and reclamation measures would protect and enhance travel management by preventing degradation of areas that are often focal points for OHV use when pursuing related recreational activities. Relocation to suitable soil types would reduce unacceptable erosion levels.

Remediation of hazardous materials, protection of riparian and wetland areas, or case-by-case management of soil-disturbing activities would potentially cause temporary or permanent closure, decommissioning, or restriction of some access roads to motorized and non-motorized travel. Highly traveled recreation areas would be monitored for sediment reduction, which would limit access to certain recreation places. Protection or establishment of buffer zones to protect riparian and wetland habitat and ensuring that standards for water quality were met would protect and enhance opportunities to improve the scenic qualities of affected travel management settings.

Short-term impacts of vegetation treatment or manipulation, prescriptive treatments, or wildfire management activities would include temporary road closures, which would displace recreationists. The potential for, and degree of, these impacts would depend largely on acres treated and miles affected. However, these activities would provide additional roads for consideration for designation under the travel management system. Vegetative manipulations meeting Standards for Rangeland Health would improve the quality of the Travel Management and OHV experience by improving scenery and stabilizing soils.

Short-term impacts from wildfire management and mineral activities would include increased traffic on BLM-administered routes and routes that remained accessible during these activities. However, OHV use would potentially increase as a result of new trails created by suppression activities. With full suppression, the long-term health of the vegetation in Travel Management and OHV settings would be likely to decline because wildfire would not be used for multiple resource objectives. Additionally, access roads developed for mineral, renewable energy, or forestry (timber harvest) activities would enhance travel opportunities through public road development (if the roads were located in a TMA). New permanent routes established for mineral development would increase public access; however, these same roads could create high traffic areas in which the roads were not designed to handle, causing safety concerns for users of the road/roads. Until successful rehabilitation and re-vegetation was completed, fire-treated areas would become less desirable for OHV use, and visual qualities in these areas would be reduced.

Visual resources are an important determinant of the quality of Travel Management and OHV settings. VRM classifications would limit the type, location, and density of roads in TMAs. Management activities in sensitive visual areas would be more restrictive for transportation system expansion. Depending on the VRM classification, changes would be made to keep routes open such as following basic elements of form, line, color, and texture. If routes were in non-compliance with VRM management objectives, they would potentially have to be modified, rerouted, or closed.

Timber harvesting actions would change the natural setting that many users seek by creating an expanded network of road and vehicle routes.

Although most impacts would be short-term and occur only during development activities, minerals management actions, including heavy equipment and truck traffic would impact public access. Minerals activities in areas with special status or priority species would be designed to mitigate impacts, which would prohibit or restrict public access to roads. Facilities associated with development would convert an area from a predominately natural setting to a more industrialized setting, which would degrade the scenic quality for users, resulting in avoidance of the area by some users.

Travel management prescriptions and activities would designate Open, Closed, or Limited areas and routes would be designated Open Yearlong, Open with Restrictions, Closed Yearlong, Decommissioned, or Game Retrieval Roads. These routes would be completed during site-specific travel management planning and the BLM's 2003 *Record of Decision, Off-Highway Vehicle Environmental Impact Statement and Proposed Plan Amendment for Montana, North Dakota, and South Dakota* would be followed. Under the OHV ROD,

motorized, wheeled cross-country travel would be allowed during any military, fire, search and rescue, or law enforcement emergency action.

Impacts to travel management (short and long-term) would depend on specific restrictions. Closures for resource protection would cause an overall net decrease of available routes within TMAs. Activities to maintain and restore riparian habitat would lead to the relocation of roads and trails outside riparian areas. If travel routes would need to be relocated or closed, implementation of recovery programs, mitigation activities, or projects to avoid impacts or enhance riparian and wetland resources (or designated plants) would impact travel management. These impacts would be short-term if closures were temporary and long-term if closures were permanent.

Constructing new roads, primitive roads, and trails to approved engineering standards would increase travel management access.

New easement agreements with private landowners would increase accessibility for motorized and non-motorized travel into BLM-administered lands. Agreements for ROWs within TMAs would lead to improved trail accessibility, which would increase route connectivity. Land acquisitions and easements would improve public access and expand both motorized and non-motorized opportunities. Land use authorizations would increase and improve the BLM's transportation network by providing additional roads and increasing public access. Closing or decommissioning roads or identifying lands for disposal would decrease public access. Road restrictions or road development would limit travel opportunities or reduce overall available routes.

Because a direct correlation exists between travel management decisions and conflict levels amid motorized and non-motorized users, travel management decisions that created separate use areas would reduce conflicts between motorized and non-motorized users. Conversely, travel management designations that mixed motorized and non-motorized recreation use would lead to increased conflict.

There is also a direct correlation between area and route management decisions and the level and quality of recreational opportunities available to motorized or non-motorized users. For motorized users, reductions in the availability of motorized areas and designated routes would mean fewer areas and fewer miles of designated roads or motorized trails available for recreational driving or access of full-sized or OHV vehicles. Conversely, for non-motorized users, fewer motorized areas and designated routes would mean more areas and more miles of closed roads or trails available for quiet, non-motorized (hiking, biking, or horseback riding) recreation.

Regardless of the type of recreation activity (motorized or non-motorized), dispersing use activity within areas managed primarily for motorized or non-motorized use would increase the quality of the recreational experience. Dispersing users over a larger area would result in fewer encounters, improve road and trail safety, and increase the quality of the recreational experience.

Regardless of the character of recreational settings on public lands, the public's desired experiences and other quality of life benefits would not be met. Limited routes or closures would assist with keeping the recreation character setting, however, various public trips would potentially not be possible and negative consequences would potentially occur with visitors going elsewhere to achieve outcomes, or illegal off-road activities to achieve their expeditions. If the character of public land's recreation settings was disregarded, the public's desired experiences and other quality of life benefits would not be met. Although limited routes or closures would assist with keeping the recreation character setting, various public expeditions would potentially not be met and impacts would potentially occur, including decreased use (as visitors go elsewhere to achieve desired outcomes), or illegal off-roading activities to achieve desired recreational experiences.

Wind power development and new utility ROWs would create new visual intrusions that altered scenic qualities and OHV and travel management settings in localized areas.

To restrict public access to hazardous sites, activities related to cleanup, remediation, and closure of contaminated or abandoned mine sites would close system roads and trails.

ALTERNATIVE A (No Action)

Summary Statement

Alternative A provides current management actions that allow approximately 2,400 acres of open OHV use, 80 acres of closed OHV use and approximately 2.75 million acres of limited OHV area designation. This alternative compromises enforcement of any "new" roads or trails that may be developed, and then classified as "existing" roads and trails, preventing BLM from knowing when and where the use occurs, resulting in a situation in which resource impacts are not monitored. For this reason, Alternative A would not meet travel management objectives of enhancing sustainable access or protecting resources.

Resources & Resource Uses

Protective measures for cultural resources or restricting surface-disturbing activities and off-road big game retrieval would decrease the number of roads and trails available for motorized use for all or part of the year (if roads were closed or decommissioned) or modify the locations and routes of proposed roads and road realignments.

No travel restrictions would protection of lands with wilderness characteristics would occur on dispersed recreational lands.

Allowing native hay or seed harvest; surface-disturbing, disruptive, mineral, or realty activities; prescriptive treatments, or vegetation treatments or manipulations would provide additional roads for consideration for designation under the travel management system. Access roads developed for mineral, realty, or forestry (timber harvest) activities would enhance travel opportunities through public road development (if the roads were located in a TMA). New permanent routes established for mineral development would increase public access. OHV use may increase as a result of new trails created by fire suppression activities. However, new access roads for mineral or realty development would also increase traffic on BLM-administered routes that could create impacts on condition of roads within these high impact areas.

However, increased traffic on any of these roads would potentially cause conditions to decrease and could displace some users. Sometimes newly constructed roads are not available for general public access, but on most occasions in the planning area they are open to the public if they have legal public access. Limitations on these activities come from stipulations on surface-disturbing activities, not the travel management designations. Increasing the amount of approved road construction could compromise enforcement capabilities and render travel planning ineffective due to a constant increase in motorized routes. Even though accessibility would be increased, it would not allow travel planning in these areas to provide enhanced resource protection. Facilities developed on approved public land would still potentially affect the same settings by creating contrasting elements to the existing settings with presence (i.e., the size and height of the structure), noise, and visual intrusions.

Short-term impacts from wildfire management and mineral activities would include increased traffic on BLM-administered routes and routes that remained accessible during these activities. Impacts on road conditions would occur on high impact areas. Until successful rehabilitation and re-vegetation was completed, fire-treated areas would become less desirable for OHV use and visual qualities in these areas would be reduced.

Road restrictions would cause an overall reduction in available routes. VRM Class I and II designations would limit travel planning options and new road development. Designated and proposed travel management routes would be rerouted or closed within VRM Class II areas and not allowed in VRM Class I. Route restrictions and closures would occur during wildfire management activities, prescriptive treatments, and vegetation treatments or manipulation, which would directly impact travel management through displacement of recreationists. The potential for, and degree of, these impacts would depend largely on acres treated and miles of road affected.

Timber harvesting actions would change the natural setting that many users seek by creating an expanded network of road and vehicle routes.

Minerals activities in areas with special status or priority species would be designed to mitigate impacts, which would prohibit or restrict public access to roads. This would reduce access across the planning area depending on where these mitigation decisions took place.

All existing travel plans, including sub-planning and emergency area closures, would be carried forward and remain in effect under this alternative. Wheeled travel management would continue in accordance with the BLM's 2003 *Record of Decision, Off-Highway Vehicle Environmental Impact Statement and Proposed Plan Amendment for Montana, North Dakota, and South Dakota*. However, the BLM, during its travel management planning process, will be moving from an interim designation of "limited to existing roads, primitive roads, and trails," to a designation of OHV limited to designated routes upon completion of a travel management plan.

Glendive Short Pine OHV Area and Terry OHV Area would be Open OHV use, no limits to the area available for OHV users.

Special Designations

OHV restrictions in the Howrey Island ACEC would disperse users over a larger area and result in fewer encounters between recreationists. However, these actions would also decrease miles of roads available for OHV use.

The Smokey Butte ACEC is closed to OHV use in this Alternative which protects resources within the boundaries of this area but decreases access for motorized use.

Alternative A manages motorized travel in all WSAs to the minimum travel management decision allowed in WSAs. The management action to allow motorized and mechanized travel only on designated roads and trails that were identified during the inventory phase of the wilderness review would remain in effect and would enhance resource protection and minimum standards for access.

ALTERNATIVE B

Summary Statement

Travel management objectives under Alternative B would result in travel management systems that provide an increased resource protection focus for over 80% of the planning area. This alternative allocates more acres to resource protections through other resource and resource use programs than Alternative A, and therefore would result in fewer acres allocated to an increased access focus. These objectives are based primarily on program needs to protect resources or enhance resource uses. Alternative B closes all acres to Open OHV use, allows approximately 2.69 million acres of limited OHV area designation, and closes approximately 63,800 acres of OHV use.

Resources

Although limiting surface-disturbing activities on sensitive soils or badland and rock outcrops, floodplains or riparian areas would prevent the development of new roads to access public lands, recreation sites or resource use actions. Limiting roads would maintain, enhance, or increase the recreational settings and supplemental values through an unaltered landscape, which would allow for a more natural and primitive recreation experience; but not allow for resource development or improved access to public lands.

Prioritizing treatment areas in which invasive species were present would decrease the amount of invasive species, and would, in turn, increase the desirability of the Travel Management and OHV setting. However, since surface-disturbing activities to control invasive species would not be allowed, the species would continue to degrade the quality of the setting desired by the recreationist.

Specific wildlife management actions identified to protect resources from motorized vehicle travel such as closing or reclaiming roads to reduce road density and habitat fragmentation, and avoiding authorizing road

development would result in travel planning decisions that provide increased protections for these resources. The level of access restrictions that would result from these management activities is not quantifiable and access reductions would occur randomly across the planning area.

Protective measures for cultural resources or restricting surface-disturbing and disruptive activities would decrease the number of roads and trails available for motorized use for all or part of a year (if roads were closed or decommissioned) or modify the locations and routes of proposed roads and road realignments.

Short-term impacts from wildfire management and mineral activities would include increased traffic on BLM-administered routes and routes that remained accessible during these activities. Until successful rehabilitation and re-vegetation was completed, fire-treated areas would become less desirable for OHV use and visual qualities in these areas would be reduced.

Impacts from VRM designations would be similar to Alternative A.

OHV use would be closed on approximately 63,800 acres on non-WSA lands with wilderness characteristics decreasing motorized access into these areas protecting resource concerns. This would result in travel planning that increases resource protections and minimizes non-motorized vehicle user conflicts with motorized vehicle users.

Resource Uses

Allowing mineral or realty activities would provide additional roads to be considered for designation under the travel management system. Access roads developed for mineral, realty, or forestry (timber harvest) activities would enhance travel opportunities through public road development (if the roads were located in a TMA). New permanent routes established for mineral development would increase public access. Additionally, OHV use may increase as a result of new trails created by fire suppression activities.
Alternative B opens fewer acres than Alternative A to resource uses under standard stipulations, this would result in an increase in resource protections but decrease accessibility.
Eliminating management of forestlands for forest products would lessen the development of new routes that are desirable by OHV users of public lands.

Travel Management and OHV actions that prohibited off-road travel for big game retrieval would protect the recreational setting from route proliferation; however, such actions would also impact accessibility and opportunities for big game retrieval for some recreationists.

Prohibiting surface-disturbing or disruptive activities within 0.5 miles of sport fish reservoirs would preclude development of roads unless there was a benefit to the aquatic wildlife habitat. This would reduce the value of a developed recreational opportunity, but provide fish habitat and a primitive experience.

SRMAs are areas where recreation opportunities and outcomes are sustained through several management decisions, including travel management. Therefore management in SRMAs would have the potential to impact travel management and access in these areas.

Glendive Short Pine OHV Area and Terry OHV Area restrictions would reduce Open OHV use, limit the area available for OHV users, and decrease the recreational experience in this area.

OHV restrictions in the Howrey Island SRMA would decrease miles of road available for OHV use and protects resources but decreases motorized use.

Special Designations

The Smokey Butte ACEC, Cedar Creek Battlefield ACEC, Flat Creek ACEC, Powderville Paleontological Area ACEC, Long Medicine Wheel ACEC, Walstein ACEC and Yonkee ACEC are closed to OHV use in this Alternative which protects resources within the boundaries of this area but decreases access for motorized use.

Alternative A manages motorized travel in all WSAs to the minimum travel management decision allowed in WSAs. The management action to allow motorized and mechanized travel only on designated roads and trails that were identified during the inventory phase of the wilderness review would remain in effect and would enhance resource protection and minimum standards for access.

ALTERNATIVE C

Summary Statement

Alternative C allows for 640 acres of Open OHV use, approximately 2.75 million acres of limited OHV area designation and 550 acres of closed OHV use within the planning area. This alternative manages for more access than Alternative B but less than Alternative A. Alternative C manages for increased resourced protection, more so than Alternative A, but less than Alternative B.

Resources

Impacts to surface-disturbing activities on sensitive soils or badland and rock outcrops, floodplains or riparian areas are the same as Alternative B.

Invasive species actions that allowed surface-disturbing activities in areas with invasive species infestations and used Early Detection Rapid Response in publicly accessible areas would decrease the amount of invasive species and improve the quality of the Travel Management and OHV setting desired by recreationists.

Restricting surface-disturbing activities or requiring protective measures for cultural resources would decrease the number of roads and trails available for motorized use for all or part of the year (if roads were closed or decommissioned) or modify the locations and routes of proposed roads and road realignments. However, in some areas, the number of roads and trails would potentially increase (or remain the same) because approved mitigation measures would be applied.
Wildfire management implementation plans for natural ignition to achieve multiple objectives would be used to protect, maintain, and enhance resources, which would help retain the quality of the Travel Management and OHV setting over the long-term since excessive fuel loads would be less likely to build up and drive high-intensity fires that sterilized soils and complicated reclamation. More frequent, less-intense fires would serve to rejuvenate vegetation and enhance the setting following re-vegetation.

Short-term impacts from wildfire management and mineral activities would include increased traffic on BLM-administered routes and routes that remained accessible during these activities. Until successful rehabilitation and re-vegetation was completed, fire-treated areas would become less desirable for OHV use and visual qualities in these areas would be reduced.

Impacts from VRM designations would be similar to Alternative A.

Travel restrictions on lands with wilderness characteristics would be the similar to Alternative A.

Resource Uses

Allowing native hay or seed harvest; vegetation treatments or manipulations; surface-disturbing, disruptive, mineral, or realty activities; or prescriptive treatments would provide additional roads to be considered for designation under the travel management system. Access roads developed for mineral, realty, or forestry (timber harvest) activities would enhance travel opportunities through public road development (if the roads were located in a TMA). New permanent routes established for mineral development would increase public access. OHV use may increase as a result of new trails created by fire suppression activities.

Timber harvesting actions would change the natural setting that many users seek by creating an expanded network of road and vehicle routes. Managing forestlands to enhance the health and resiliency of the forest and woodland resources for sustainable resource health would create an undesirable setting for users in the short-

term. In the long-term, the actions would create a healthy forest ecosystem, which would increase the visual setting for users.

Minerals activities in areas with special status or priority species would be designed to mitigate impacts, which would prohibit or restrict public access to roads.

Under Alternative C, OHV management actions administering off-road travel for big game retrieval would allow access and opportunity for big game retrieval for recreationists who may not otherwise be able to participate. However, this action would also alter existing settings and decrease values and resources for other recreationists who seek primitive recreation experiences and possibly lead to unauthorized route establishment.

Prohibiting surface-disturbing or disruptive activities within 0.25 miles of sport fish reservoirs would preclude development of roads unless there was a benefit to the aquatic wildlife habitat. This would reduce the value of a developed recreational opportunity, but provide fish habitat and a primitive experience. Modifying the Glendive Short Pine OHV boundary and dropping approximately 339 acres from OHV use would not reduce visitor experiences or enjoyment because the area is rarely used by motorized users. OHV use would be designated Open on approximately 640 acres and restricted to existing roads and trails on the remaining 2,091 acres, which would reduce user conflicts between motorized and non-motorized users. While the entire area would no longer be designated Open, the majority of roads and trails in use and a portion of the area would remain open for motorized users.

Designating the Terry OHV Area a SRMA, and limiting OHV use to existing roads and trails would reduce user conflicts between motorized and non-motorized users. While the entire area would no longer be designated Open, the majority of roads and trails in use would remain Open for motorized users. However, this action would displace some recreationists to other Open areas and increase trails on adjacent or nearby public land.

Special Designations

All ACEC's travel management would be limited OHV area designation. Where sensitive resources risk the potential of adverse impacts from travel on existing routes, adequate protect would not occur.
Alternative C for WSAs is the same as Alternative A and B.

ALTERNATIVE D

Summary Statement

Alternative D allows for approximately 1,970 acres of Open OHV use, approximately 2.75 million acres of limited OHV area designation and zero acres of closed OHV use within the planning area. This alternative manages for more access than Alternative B but less than Alternative A. Alternative D manages for less resource protection than Alternatives A, B or C.

Resources

Impacts to surface-disturbing activities on sensitive soils or badland and rock outcrops, floodplains or riparian areas are the same as Alternative B.

Prioritizing invasive species treatment areas and allowing surface-disturbing activities in areas in which invasive species were present would decrease the amount of invasive species, and would, in turn, increase the desirability of the Travel Management and OHV setting for users.

Stipulations put in place in areas with special status or priority species that would be designed to mitigate impacts, in turn, would prohibit or restrict public access to roads causing an adverse impact to OHV users.

Impacts to cultural resources are similar to Alternative C.

Short-term impacts from wildfire management activities would include increased traffic on BLM-administered routes and routes that remained accessible during these activities. Until successful rehabilitation and re-vegetation was completed, fire-treated areas would become less desirable for OHV use and visual qualities in these areas would be reduced. However, beneficial fire suppression impacts would help retain the quality of the Travel Management and OHV setting over the long-term since excessive fuel loads would be less likely to build up and drive high-intensity fires that sterilized soils and complicated reclamation. More frequent, less-intense fires would serve to rejuvenate vegetation and enhance the setting following re-vegetation.

Road restrictions from other resources would cause an overall reduction in available routes. Route restrictions and closures would occur during wildfire management activities, prescriptive treatments, and vegetation treatments or manipulation, which would directly impact travel management by displacing recreationists. The potential for, and degree of, these impacts would depend largely on acres treated and miles of road affected.

Impacts from VRM designations would be similar to Alternative A.
Impacts from travel restrictions on lands with wilderness characteristics would be the similar to Alternative A.

Resource Uses

The impacts and level of new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A.

Impacts to managing forestlands for a diversity of forest product production and resource enhancement would be similar to those described under Alternative C.

Allowing surface-disturbing and disruptive activities near designated sport-fish reservoirs with specialized design features could decrease protection of these sites. However, this would provide a developed recreational opportunity, whole protecting fish habitat and the site.
Under this alternative, Glendive Short Pine OHV Area would be managed with Open OHV use on 1,900 acres and Limited OHV use on 810 acres. Modifying the Glendive Short Pine OHV area boundary by approximately 300 acres would still provide recreational opportunities and activities for motorized users. Direct, short-term impacts of OHV use (noise and decreased air quality) would diminish the recreational experience for other dispersed recreational users (such as campers and hikers). OHV on open areas would continue to provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing, and access to remote areas.

Managing the Terry OHV Area with Open OHV use on 72 acres would provide recreational opportunities and activities for motorized users. Direct, short-term impacts of OHV use (noise and decreased air quality) would diminish the recreational experience for other dispersed recreational uses such as camping and hiking. OHV use would provide additional recreational activities and opportunities for self-achievement such as driving for pleasure, wildlife viewing, and access to remote areas.

Special Designations

Impacts to all ACEC's travel management would be limited OHV area designation, similar to Alternative C.

Alternative D for WSAs is the same as Alternative A, B and C.

ALTERNATIVE E (Proposed)

Summary Statement

Alternative E allows for zero acres of Open OHV use, approximately 2.75 million acres of limited OHV area designation and 2,800 acres of closed OHV use within the planning area. This alternative manages for less

Open access than Alternative A, C or D but more Limited Access than Alternative B. Alternative E also allows less Closed OHV use than Alternative B, so provides more resource protections than Alternatives A, C and D.

Resources

Impacts to surface-disturbing activities on sensitive soils or badland and rock outcrops, floodplains or riparian areas are the same as Alternative B.

Impacts for invasive species control are the same as Alternative C.

Impacts to cultural resources are similar to Alternative C. Impacts from Wildfire are similar to Alternative D. Impacts from VRM designations would be similar to Alternative A.

Travel restrictions on lands with wilderness characteristics would be the similar to Alternative A.

Resource Uses

The impacts and level of new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A. However, the level of development or surface disturbance in sensitive resource areas would be limited.

Impacts to managing forestlands for a diversity of forest product production and resource enhancement would be similar to those described under Alternative C.

Travel Management and OHV actions that prohibited off-road travel for big game retrieval would protect the recreational setting from route proliferation but also reduce accessibility and opportunities for big game retrieval for some recreationists.

Impacts from actions that are near designated sport-fish reservoirs are the same as Alternative D.

Closing OHV use on the east side of the walking trail at Howrey Island would reduce user conflicts between motorized and non-motorized users but would displace some recreationists who rely on travel to the east portion by vehicle.

The Glendive Short Pine OHV Area would be modified from “Open” to “restricted to existing roads and trails”. Restricting OHV use to existing roads and trails on the remaining 2,272 acres would reduce user conflicts between motorized and non-motorized users. While the area would no longer be designated Open, the majority of roads and trails in use would remain open for motorized users. This action could relocate recreationists to other Open areas and potentially increase trails on adjacent or nearby public land.

The Terry OHV Area would no longer be designated “Open”, rather limited OHV area designation. Impacts from this modification are expected to be similar as those of the Glendive Short Pine OHV Area and in Alternative D.

Special Designations

Alternative E for WSAs is the same as Alternative A, B, C, and D.

The Long Medicine Wheel and Walstein ACECs are closed to OHV use in this alternative which protects resources within the boundaries of this area but decreases access for motorized use, impacts similar to Alternative B. Impacts to the remaining ACEC’s would be similar to Alternatives A, C and D.

CUMULATIVE IMPACTS

Closure, decommissioning, or rerouting segments of the existing transportation system would result from route-by-route evaluations within each TPA upon completion of site-specific travel management plans. As

they changed in the future, social and environmental considerations would be made when evaluating each TMA. Each TMA would need sign placement and long-term monitoring, which would result in increased travel management costs. Any new or related special designation areas on federal or adjoining private or state lands would be managed in a way that would not jeopardize special resource values in the area; however, this management would potentially alter the transportation network. All management planning for implementation actions would follow criteria in 43 CFR 8342.0-3, and 43 CFR 8340.0-5 for OHV area designations. Cultural resources would attract the attention of recreational OHV users.

Limiting OHV use to designated routes would confine soil and vegetation disturbance caused by motor vehicles to existing routes, and result in no additional change to the natural character of the non-WSA lands. The presence and noise of vehicles using these routes, however, would reduce the opportunity of visitors to find solitude, particularly in close proximity to the routes. Motorized uses would conflict with primitive and unconfined recreation opportunities sought in non-WSA areas.

In the past, vehicle travel across public lands in the planning area was allowed without restrictions except in national parks or other specially designated areas. Not until the 1980s did the BLM considered restricting such travel on BLM-administered lands in the planning area. Now, most of the lands in the planning area are restricted to existing roads and trails until authorized to remain Open, Limited, or Closed. There are few opportunities for open OHV use (driving anywhere) and the BLM anticipates this trend to continue into the future.

Travel management and OHV use is dependent on the natural resource base and the weather for quality experiences sought by recreationists. Climate creates opportunities and limitations for outdoor recreation. Higher temperatures could result in increased opportunities for OHV use for a longer portion of the year (fall and winter) in the MCFO. Decreased opportunities for warm season activities could also happen during the hottest part of the year from higher heat, forest fires, or reduced air quality caused by climate changes to the natural resource base, thus changing settings sought by recreationists. The extent of the potential impacts is highly dependent on the type of activity, the climate change that occurs, and how the recreationist adapts to the changes.

All of the alternatives in the RMP (A through E) would contribute to the anticipated cumulative impacts.

LANDS AND REALTY

This section describes potential impacts to the lands and realty program from management alternatives. Included in the lands and realty program are land tenure adjustments (e.g., sales, exchanges, acquisitions), land use authorizations (i.e., leases, permits, grants), and withdrawals, classifications, and segregations. Lands and realty actions (land use authorizations) also authorize ROWs and renewable energy. This section focuses on how management actions could impact the lands and realty program by increasing, limiting, or preventing the potential for realty actions.

The purpose of the lands and realty program is to facilitate management of BLM-administered lands and resources in the planning area. The program adapts according to changing land management, resource needs, demand for public land to meet expanding communities and other public purposes, and other issues. Therefore, lands and realty program actions generally result in beneficial impacts in the planning area in relation to multiple-use objectives.

Adverse impacts to the lands and realty program result from management actions that reduce the available land base or make land tenure adjustments or land use authorizations more difficult. Beneficial impacts to the lands and realty program result from land tenure adjustments that increase land management efficiency or enhance the management of resources through consolidation of public lands into more easily managed blocks. Direct impacts to lands and realty occur when other resources are present, preventing or making it more difficult to complete a transaction. Mitigating resource values required for a land disposal transaction can require further lands and realty actions and increase processing costs and timeframes required to complete the transaction and temporarily delay the transaction. Indirect impacts to the lands and realty program result from management that

subsequently affects realty actions, such as the development of parcels transferred out of BLM ownership, which can increase, limit, or prevent the potential for future realty actions. Most impacts to the lands and realty program would be long-term and result from management that allocates land for land tenure adjustments or land use authorizations over the course of the planning period.

Impacts that affect the lands and realty program result from management that increases, limits, or prevents the potential for realty actions. The primary impacts under the alternatives would be associated with lands identified for potential disposal, acquisition, and withdrawal, and management that make realty actions more difficult to complete. In the past, there has been very little change in land tenure through either disposal or acquisition, and this trend is expected to continue.

LAND USE AUTHORIZATIONS

ASSUMPTIONS AND METHODOLOGY FOR ALL ALTERNATIVES

There would be increased demand to construct utility ROWs, particularly for electrical transmission lines, pipelines, and communication towers within the planning area. Testing for pilot projects for carbon geo-sequestration would be allowed in the planning area in accordance with the goals and objectives for other resource values. Requests for testing for carbon geo-sequestration pilot projects in suitable and acceptable areas would be considered under a Title V FLPMA ROW or a Title III FLPMA land use permit. It is assumed that the demand for land use permits and leases would fluctuate directly in relation to the degree of economic growth and development occurring within and adjacent to the planning area.

Unauthorized uses would continue to occur and be resolved on a case-by-case basis. These would include activities such as unauthorized use, occupancy, and property abandonment and ROWs for utility and transportation uses, communication sites, oil and gas pipelines, roads, and water-related facilities installed on BLM-administered lands without proper approval.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources, reviews of existing literature, information found in BLM records, and information provided by other agencies and institutions. To analyze the potential impacts of the alternatives on the lands and realty program, information was gathered from administrative files for lands and realty actions in the planning area and other resource programs. Analysis is also based on the MCFO realty specialist's knowledge of the area and the professional expertise of BLM specialists at the MCFO and Montana State Office.

ROW avoidance areas are areas that, although they would be avoided, may be available for ROW location with special requirements. ROW exclusion areas are areas that would not be available for ROW location under any conditions. Effects are quantified where possible but, in the absence of quantitative data, best professional judgment was used.

Exclusion and avoidance acres for ROWs and other surface-disturbing or disruptive land use authorizations for Alternatives A, B, C, D, E were determined using GIS to allow for the overlap of the various resource management actions. Avoidance acres overlap with excluded areas were removed from the acres under the *Program Management* heading.

ASSUMPTIONS AND METHODOLOGY

There would be 55 minor ROWs issued per year by the BLM, with an average surface disturbance of 2 acres per ROW in the short-term. Three of the smaller ROWs would be for overhead power lines and average a total of 1 mile each year. Approximately 1/2 of the minor ROWs would be fully reclaimed in the long-term; not including linear ROWs such as roads. In the short-term, five major pipeline ROWs would be issued, which would disturb 120 acres each for an average of 12 major pipelines that would disturb 720 acres in the long-term. There would also be one major power line ROW (disturbing 60 acres) issued in the short-term for an average of eight major power lines (disturbing 160 acres) issued in the long-term. There would be one major railroad ROW (disturbing 140 acres) issued in the short-term. It is assumed that a new Major ROWs would be located within or next to compatible existing Major ROWs, for example within or next to the Bison

Pipeline ROW area, the Butte-Bridger Pipeline/Grasslands Pipeline ROWs area in Carter County or a State Highway.

There would be two pilot carbon sequestration test projects in the short-term and five pilot test projects in the long-term. The BLM would issue a project ROW or 2920 land use permit that would include two wells to gather baseline data, two injection wells, and four associated monitoring wells for each injection well. Each well would disturb 3 acres. Each project would have one associated facility that would disturb 1 acre. The wells would be drilled to 2,000 to 10,000 feet true vertical depth. Each well would take 30 days to complete. Air, carbon dioxide, or nitrogen would be used in site testing of these projects. Opportunities for geophysical carbon sequestration on federal lands would be considered as outlined in national guidance. Interim reclamation would occur on the pilot project until a determination is made on project viability and permitting guidance. The assumption is ½ of the project area would be reclaimed in the interim and full reclamation once the project is abandoned.

There would be one new 2920 permit (Leases/Permits/Easements) issued by the BLM per year with an average of 3 acres of surface disturbance per permit. There would be one 2920 land use lease or lease amendment issued in the short-term and three issued in the long-term, with an average of 50 acres disturbed for each. It is assumed approximately 25% of the permits will be reclaimed in the long-term.
See *Disturbance Appendix*, Table 1, for assumed disturbance acres per alternative based on percent of the planning area with resource restrictions.

IMPACTS COMMON TO ALL ALTERNATIVES

Managing BLM-administered lands to protect air; soils; water quality; vegetation (including hardwood draws, special status plant species, and riparian and wetland areas); wildlife, fisheries, or aquatics habitat (including special status wildlife species habitat); cultural and paleontological resources; visual resources; special designation areas; and WSAs would impact the issuing of land use authorizations such as ROWs, leases, and permits on BLM-administered land in the planning area. In areas that were not excluded from development, proposals for ROWs and other land use authorizations would be evaluated on a case-by-case basis. Facilities and actions that were projected to adversely impact these resources would need to be mitigated, sited in acceptable alternative locations, or, in some cases, denied altogether. Impacts from facilities and actions authorized by ROWs, leases, and permits would need to be mitigated through actions such as the application of stipulations or relocation to acceptable alternative locations; however, in some cases, the proposed project would be denied. As a result of these actions and required inventories, applicants for such proposals would incur time delays and greater costs for project development. In some cases, with appropriate justification and documentation, the AO may modify or waive a management action or determine the project would be exempt from a management action, which would result in some flexibility in the location of the proposed project.

Applicants for ROWs (including testing for pilot projects for carbon geo-sequestration, see the *Lands and Realty-Renewable Energy Appendix*) and other land use authorizations would incur time delays and greater costs for project development as a result of the following management actions: requiring inventories for various resources, requiring distance and timing stipulations for various wildlife species (there is the potential for a project to be delayed from December 1 through August 1 by timing stipulations), following the most recent guidance from the Avian Power Line Interaction Committee, currently 2012 (APLIC 2012), for overhead power lines, requiring Section 7 consultation, requiring cultural resource surveys and Section 106 consultation for NHPA, requiring consultations with interested tribes and American Indian Tribes as Sovereign nations, and requiring surveys for black-footed ferrets prior to surface disturbance for proposed projects in black-footed ferret habitat. Surveys of black-footed ferret habitats would restrict the proposed project, force construction in alternate locations, or, in some cases, cause denial of the project.

Managing approximately 83,000 acres of VRM Class I areas as exclusion areas for ROWs and other land use authorizations would prevent development on approximately 3 percent of the BLM-administered surface in the planning area.

Requiring compliance with VRM objectives, or timing stipulations for ROWs or other land use authorizations would increase the time and cost for applicants or, in some cases, result in avoidance of the area or denial of the proposed project.

Managing lands as avoidance areas for ROWs and other land use authorizations would limit opportunities for ROW and other land use authorization development in the planning area by increasing costs and processing time if applications were submitted. Applicants would incur time delays and greater costs for project development in areas with inventory or mitigation needs. Restrictions on facility placement, limited access, increased administrative costs, and installation of facilities in less-than-optimum sites could all result if applicants applied for authorizations in avoidance areas. In some instances, an area that is not closed to ROWs and other land use authorizations would become uneconomical to develop due to the cost of implementing mitigation measures and the decrease in general potential. Areas managed as avoidance areas under all alternatives would include the Big Sheep Mountain, Hoe, Jordan Bison Kill, Powder River Depot, Seline, and Finger Buttes ACECs. These actions would impact 3,672 acres total, less than 1 percent of BLM-administered surface acres in the planning area. Other ACECs are addressed individually by alternative.

Continuing to manage the 83,000 acres of land within the five WSAs in the planning area under BLM Manual 6330, *Management of Wilderness Study Areas*, would impose restrictions on land use authorizations in these areas and effectively designate these acres ROW avoidance areas. This management action would impact 3 percent of the BLM-administered surface in the planning area.

Potential geophysical carbon sequestration projects on federal lands would reduce the amount of carbon dioxide being released into the air, which would limit the effect of the sequestered carbon dioxide in contributing to climate change. Fire and fuels management actions under Impacts Common to all Alternatives would generally help protect facilities on public lands authorized through the lands and realty program (such as power lines and communication sites) by reducing fuel loads and suppressing fires.

Locating new communication facilities within existing compatible communication sites and major ROWs within or next to compatible existing ROWs, such as highways and railroads, would minimize the resources affected and the number of acres required for and disturbed by new ROWs. Requests for ROWs and other land use authorizations would be considered on a case-by-case basis (with appropriate stipulations applied to protect resource values). Management actions would be subject to prior existing rights. Land use authorizations would not be issued for uses that involved the disposal or storage of material that contaminated the land. This management action would prohibit completion of some proposed projects and cause alternative actions such as project modification or relocation.

Exclusion of portions of the planning area, and in some instances, mitigation restrictions in avoidance areas would have the potential to affect proposals on non-BLM-administered lands if facilities or development was contingent on public land availability and authorization. The areas that lie outside of the exclusion and avoidance areas would provide the best opportunity for development of ROWs and other land use authorizations. Impacts from specific management actions that would apply ROWs and other land use authorization development are summarized under each alternative to indicate the percentage of the area affected.

Unauthorized uses of public land would be resolved in an expeditious manner and, in some cases, result in continued use under short-term authorizations.

ALTERNATIVE A (No Action)

Summary Statement

ROWs would be allowed on approximately 2.59 million open acres (94 percent) of the BLM-administered surface in the planning area.

Excluding ROWs and other surface-disturbing land use authorizations on 128,960 acres would limit implementation at certain times or prohibit ROWs and other land use authorizations for proposed projects on

BLM-administered lands in the planning area. These restrictions would impact 5 percent of the BLM-administered surface in the planning area.

Avoiding ROWs and other surface-disturbing land use authorizations on 35,830 acres of BLM-administered surface in the planning area would increase the cost and time of proposed projects and reduce opportunities for the public to receive ROWs and other land use authorizations. These restrictions would impact 1 percent of the BLM-administered surface in the planning area.

See Table 4-51 for open, excluded and avoided surface acres under Alternative A.

TABLE 4-51
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE A

Stipulation	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
ROWs and other land use authorizations excluded	128,960	5
ROWs and other land use authorizations avoided	35,830	1
ROWs and other land use authorizations open	2,586,740	94

Resources and Special Designations

Sharp-tailed grouse leks (est. 700,000 ac.) and greater sage-grouse leks (est. 220,000 ac) would have 2-mile construction timing restriction from March 1 to June 15, affecting 920,000 acres, 33% of the BLM administered surface in the planning area. Timing stipulations under this alternative would increase the cost and time of proposed projects.

Excluding aboveground low voltage power lines associated with oil and gas in the Powder River RMP areas or requiring buried low voltage power lines would prohibit aboveground power line ROWs on most projects in that portion of the planning area.

Allowing prescribed fire treatments on 300,000 acres of BLM-administered surface (11 percent) in the planning area would protect authorized ROWs and other land use authorization facilities, such as power lines and communication sites, by reducing fuel loads.

See Tables 4-52 and 4-53 for specific resources and special designations that would result in exclusion or avoidance surface acres under Alternative A.

TABLE 4-52.
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE A

Area or Resource		BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Wildlife	Sharp-tailed Grouse Leks and Nesting Habitat, 0.25-mile lek buffer	21,000	<1
	Double-crested Cormorant and Great Blue Heron rookeries, 1,000-foot habitat buffer (Big Dry RMP area)	160	<1
	Greater sage-grouse, 0.25-mile lek buffer	10,320	<1
	Greater sage-grouse West Decker Habitat Restoration Area, 0.25-mile lek buffer	90	<1

TABLE 4-52.
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE A

	Area or Resource	BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Rec./ VRM	Howrey Island ACEC	550	<1
	VRM Class 1	83,000	4
Special Desig. Areas	Smoky Butte (subject to prior existing rights), Battle Butte Battlefield ACECs	200	<1
	Flat Creek paleontological locality	50	<1

TABLE 4-53.
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO AVOIDANCE OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE A

Area or Resource	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Soils, slopes >30%	43,780	2
Special Desig. Areas, Reynolds Battlefield ACEC	320	<1
Black-footed Ferret Re-introduction ACEC	11,220	<1

ALTERNATIVE B

Summary Statement

ROWs would be allowed on 533,200 open acres (19 percent) of the BLM-administered surface in the planning area.

ROWs and other realty-related surface-disturbing or disruptive land use authorizations would be excluded on 2.2 million acres, which would limit implementation periods and prohibit ROWs and other land use authorizations for proposed projects on approximately 81 percent of the BLM-administered surface in the planning area. (These acres do not include invasive species acres or cultural and paleontological 0.5-mile buffers, other than those listed in Table 4-55.)

Avoiding ROWs and other realty-related surface-disturbing and disruptive land use authorizations on 50 acres of BLM-administered acres in the planning area (less than 1 percent) would increase the cost and time of proposed projects, reduce ROW and other land use authorization opportunities available for proposed projects in the planning area, or in some cases cause denial of the project. The applicant would also incur additional time and costs if the surface-disturbing activity could not be avoided and approved mitigation measures (such as applying stipulations or relocation of the project) would be required. See Table 4-54 for open, excluded and avoided surface acres under Alternative B.

TABLE 4-54
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE B

Stipulation	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
ROWs and other land use authorizations excluded	2,218,290	81
ROWs and other land use authorizations avoided	50	<1
ROWs and other land use authorizations open	533,200	19

Resources and Special Designations

Under this alternative, the presence of invasive species would require relocation of proposed projects.

Excluding aboveground low-voltage power lines unless burying is not technologically feasible would prohibit aboveground power line ROWs on most projects in the planning area. Burial of low-voltage power lines in these areas would increase the cost and time for the applicant, possibly cause conflicts with aboveground power lines on adjoining lands, and cause more surface disturbance than aboveground power lines. In some cases, these actions would cause avoidance, denial, or exclusion of the project or ROW.

Under this alternative surface-disturbing activities, including ROWs, are not allowed in sage grouse PPAs; thus no realty actions can occur in this area. If a realty proposal was submitted BLM could not approve the project; resulting in the project being pushed onto private land or project abandonment.

In the other sage grouse areas, surface disturbing activities that did not improve greater sage-grouse habitat would require compensation which would increase the cost of the project or prevent the project all together. It could also cause the project to be relocated on private lands to avoid the enforcement of compensation. Compensation in General Habitat areas would include: 1% surface disturbance cap for greater sage-grouse habitat, 5% surface disturbance cap for greater sage-grouse habitat per section, and a 1:1 Habitat Compensation Ratio. Compensation in the Priority ACEC and Restoration Areas would include: 1% surface disturbance cap for greater sage-grouse habitat, 5% surface disturbance cap for greater sage-grouse habitat per section, and 5:1 Habitat Compensation Ratio.
If surface disturbing and disruptive activities are allowed within ½-mile of bald eagle nest sites active within the preceding 5 years, special design features would be required.

Prescribed fire would not be allowed on the 2.5 million acres (91 percent) of BLM-administered surface in the planning area. Prohibiting prescribed fire would increase the susceptibility of ROW and other land use authorization facilities, such as power lines and communication sites, to damage by wildfire occurring because of untreated fuel loads.

Excluding ROWs and other land use authorizations near paleontological localities or cultural site boundaries would prohibit ROW and other land use authorizations in these areas, potentially cause an increase in the cost and time of proposed projects, and reduce opportunities for the public to receive ROW and other land use authorizations. (The average paleontological locality size with a 0.5-mile buffer is approximately 540 acres, while the average cultural site size with a 0.5-mile buffer is approximately 710 acres).

See Tables 4-55 and 4-56 for specific resources and special designations that would result in exclusion or avoidance surface acres under Alternative B.

TABLE 4-55
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE B

	Area or Resource	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Soils	Badlands and Rock Outcrop	190,670	7
	Sensitive	1,083,000	39
Water	Floodplains, 100-year	42,880	2
	Waterbodies and streams	9,520	<1
	State-designated Source Water Protection Areas	1,910	<1
Veg.	Riparian and wetland	76,350	3
	Invasive species	Unknown	
Fish and Wildlife	Big Game & Sage Grouse Crucial Winter Range	761,050	28
	Waterbird nesting colonies, 0.25-mi buffer	250	<1
	Raptor Nest sites active within the past 7 years, 0.5 mile buffer	110,160	4
	Bighorn Sheep Range	67,750	2
	Piping Plover Habitat, 0.25-mile buffer	4,350	<1
	Interior Least Tern Habitat, 0.25-mile buffer	10,230	<1
	Black-tailed Prairie Dogs Colonies, 0.5-mile buffer	151,810	6
	Pallid Sturgeon, 0.5-mile centerline habitat buffer	15,260	<1
	Greater sage-grouse Habitat – General Habitat Areas, 4-mile lek buffer	861,390	31
	Priority Areas	817,210	30
	Greater sage-grouse West Decker Habitat Restoration Area, 3 wells or fewer, 1-mile buffer	8,800	<1
Cult. and Paleo	0.5-mile buffers, including Cultural ACECs, if Cultural sites or paleontological localities would be affected	Unknown	
Lands w/Wilderness Char	Devils Creek Wrangler Rough Ridge Whitetail	28,840	1
Rec./VRM	Designated Sport-fish reservoirs, 0.5 mile buffer	10,330	<1
	Howrey Island (subject to prior existing rights)	550	<1
	ROWs excluded: Calypso, Lewis and Clark, Matthews Recreation Area, Dean S. Reservoir, Pumpkin Creek Ranch and Recreation Area, Glendive Short Pine OHV, Strawberry Hill Recreation Area, and Moorhead Recreation Area SRMAs	43,360	2
	VRM Class I	126,000	5

TABLE 4-55
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE B

	Area or Resource	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Special Desig. Area	Battle Butte Battlefield (0.5-mile buffer) 590 ac. and Smoky Butte (40) ACECs (subject to prior existing rights)	630	<1
	Reynolds Battlefield ACEC 0.5-mile buffer	1,890	<1
	Cedar Creek Battlefield Area (1,021), Flat Creek (546) and Powderville Paleontological Areas (17,634), Long Medicine Wheel Area (179), Walstein Area (1,518) ACECs	20,900	1

TABLE 4-56
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO AVOIDANCE OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE B

Area or Resource	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Special Desig. Areas, Ash Creek, Bug Creek, Sand Arroyo, Black-footed Ferret Reintroduction ACECs	32,030	1

ALTERNATIVE C

Summary Statement

ROWs would be allowed on 1.2 million open acres (45 percent) of the BLM-administered surface in the planning area.
Under Alternative C, excluding ROWs and other realty-related surface-disturbing and disruptive land use authorizations on 682,550 acres of BLM-administered surface in the planning area (25 percent) would prohibit ROWs and other land use authorizations for proposed projects on these lands. (These acres do not include the sage grouse priority habitat surface disturbance acre limitation and the cultural and paleontological site and locality 300-foot boundary buffers, other than those listed in Table 4-58). However, some management actions would allow surface-disturbing activities that benefited or maintained the functionality of specific habitat. Avoiding ROWs and other realty-related surface-disturbing and disruptive land use authorizations on 833,680 million acres of BLM-administered acres in the planning area (30 percent) would increase the cost and time of proposed projects, reduce ROW and other land use authorization opportunities available for proposed projects in the planning area, or, in some cases, cause denial of the project. The applicant would also incur additional time and costs if the surface-disturbing activity could not be avoided and approved mitigation measures (such as applying stipulations or relocation of the project) would be required.

See Table 4-57 for open, excluded and avoided surface acres under Alternative C.

TABLE 4-57
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE C

Stipulation	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
ROWs and other land use authorizations excluded	682,550	25
ROWs and other land use authorizations avoided	833,680	30
ROWs and other land use authorizations open	1,235,310	45

Resources and Special Designations

If ROWs and other surface-disturbing land use authorizations or disruptive activities would not or could not be avoided in identified areas, these activities would be authorized. However, these areas would be subject to a stipulation that required approved special design features to minimize impacts or improve or maintain vegetative community proper functioning condition; if this could not be done the project would be relocated or denied.

If low-voltage powerlines (less than 69 kV) are authorized or if ROWs and other surface-disturbing land use authorizations or disruptive activities are authorized in badlands and rock outcrops, State-designated Source Water Protection Areas, areas of invasive species infestations , designated Big Game Crucial Winter Range areas, near waterbird nesting colonies, within Bighorn Sheep Range, within ½-mile of bald eagle nest sites active within the preceding 5 years, within 0.5 mile of raptor nests active within the past 7 years, and greater sage-grouse West Decker Habitat – Restoration Areas, they would be subject to a stipulation that required approved special design features to minimize impacts or improve or maintain PFC; if this could not be done the project would be relocated or denied.

Sage grouse priority areas would allow ROWs and other surface disturbing activities with a surface acres disturbance limitation. Surface disturbance would be authorized 1 per 640 acres with a cumulative, direct, and indirect disturbance of no more than 3% of the sagebrush habitat per 640 acres from the point of the disturbance, as long as functional greater sage-grouse habitat and the associated populations were maintained at the same levels as trend areas. Disturbed areas would have to be fully reclaimed to pre-disturbance conditions or to a desired plant community before additional disturbance would be approved. If a realty proposal was submitted and the surface acres limit have not been met, BLM could approve the project; however if the acres are already achieved the project would be put on hold or not approved. This acre cap would hinder realty authorizations; push development onto private land or project abandonment.
Under this alternative, surface-disturbing activities that did not improve greater sage-grouse habitat would require compensation which would increase the cost of the project or prevent the project all together. It could also cause the project to be relocated on private lands to avoid the enforcement of compensation. Compensation in General Habitat areas would include: 1% surface disturbance cap for greater sage-grouse habitat, 3% surface disturbance cap for greater sage-grouse habitat per section, and a 1:1 Habitat Compensation Ratio. Compensation in the Priority ACEC and Restoration Areas would include: 1% surface disturbance cap for

greater sage-grouse habitat, 3% surface disturbance cap for greater sage-grouse habitat per section, and 5:1 Habitat Compensation Ratio.

Allowing prescribed fire on the entire 2.75 million acres of BLM-administered surface in the planning area would protect ROW and other land use authorization facilities, such as power lines and communication sites, by reducing fuel loads.

Excluding ROWs and other land use authorizations near paleontological localities or cultural site boundaries would prohibit ROW and other land use authorizations in these areas, potentially cause an increase in the cost and time of proposed projects, and reduce opportunities for the public to receive ROW and other land use authorizations. The average paleontological locality size with a 300-foot buffer is approximately 10 acres, and the average cultural site size with a 300-foot buffer is approximately 40 acres.

See Tables 4-58 and 4-59 for specific resources and special designations that would result in exclusion or avoidance surface acres under Alternative C.

TABLE 4-58
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE C

Area or Resource		Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Fish and Wildlife	Piping Plover, 0.25-mile habitat buffer	4,350	<1
	Interior Least Tern, 0.25-mile habitat buffer	10,230	<1
	Black-tailed Prairie Dog Colony, 0.25-mile buffer	65,820	2
	Pallid Sturgeon, 0.5-mile habitat buffer	15,260	<1
	Greater sage-grouse Habitat – General Habitat Areas, 3.1-mile lek buffer	642,340	23
	Priority Areas	Unknown *	
Cult. and Paleo	300-foot site or locality buffer, including Cultural ACECs, if sites or localities would be affected	Unknown	
VRM	VRM Class I	83,000	4
Special Desig. Areas	Flat Creek paleontological locality	50	<1

*** (surface disturbance acre limitation)**

TABLE 4-59
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO AVOIDANCE OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE C

	Area or Resource	Surface Acres	Percentage of BLM-Administered Surface in the Planning Area (%)
Soils	Sensitive	1,083,000	39
Water	Floodplains, 100-year	42,880	2
	Waterbodies and streams	9,520	<1
Veg.	Riparian and wetland areas	76,350	3
Lands w/Wilderness Char	Devils Creek	5,240	<1
Rec.	Designated Sport-fish reservoirs, 0.25 mile buffer	3,800	<1
	Howrey Island (subject to prior existing rights)	550	<1
	Calypso, Lewis and Clark, Matthews Recreation Area, Dean S. Reservoir, Pumpkin Creek Ranch and Recreation Area, Glendive Short Pine OHV, Strawberry Hill Recreation Area, and Moorhead Recreation Area SRMAs	43,220	2
Special Desig. Areas	Battle Butte Battlefield and Smoky Butte ACECs (subject to prior existing rights)	320	<1
	Reynolds Battlefield ACEC	920	<1
	Black-footed Ferret Reintroduction Area	11,220	<1
	Ash Creek, Bug Creek, Sand Arroyo, Cedar Creek Battlefield Area, Flat Creek and Powderville Paleontological Areas, Long Medicine Wheel Area, Walstein Area ACECs	41,450	2

ALTERNATIVE D

Summary Statement

ROWs would be allowed on 2 million open acres (74 percent) of the BLM-administered surface in the planning area.

Excluding ROWs and other surface-disturbing and disruptive land use authorizations on BLM-administered lands under Alternative D would prohibit ROWs and other land use authorizations on 111,210 acres of BLM-administered surface in the planning area (4 percent). (These acres do not include the sage grouse priority habitat surface disturbance acre limitation, other than those listed in Table 4-61. However, some management actions would allow surface-disturbing activities that benefited or maintained the functionality of specific habitat.

Avoiding ROWs and other realty-related surface-disturbing or disruptive land use authorizations on 617,320 BLM-administered acres in the planning area 22 percent) would increase the cost and time of proposed projects, reduce opportunities for the public to receive ROWs and other land use authorizations and, in some cases, cause denial of the proposed project. (These acres do not include cultural resource 300-foot site boundary buffers or paleontological locality buffers, other than those listed in Table 4-62.)

See Table 4-60 open, excluded and avoided surface acres under Alternative D.

TABLE 4-60.
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE D

Stipulation	Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
ROWs and other land use authorizations excluded	111,210	4
ROWs and other land use authorizations avoided	617,320	22
ROWs and other land use authorizations open	2,023,000	74

Resources and Special Designations

If low-voltage powerlines (less than 69 kV) are authorized or if ROWs and other surface-disturbing land use authorizations or disruptive activities are authorized in Sensitive soils, badlands and rock outcrops, waterbodies and streams, State-designated Source Water Protection Areas, areas of invasive species infestations, designated Big Game Crucial Winter Range areas, near waterbird nesting colonies, within Bighorn Sheep Range, within ½-mile of bald eagle nest sites active within the preceding 5 years, within 0.5 mile of raptor nests active within the past 2 years, in black-tailed prairie dog colonies, within 300 feet of boundaries of cultural resources or designated sites or areas or sites or that meet the criteria for allocation for designation, adjacent to designated sport-fish reservoirs, and Greater Sage-grouse Habitat – Restoration Areas, they would be subject to a stipulation that required approved special design features to minimize impacts or improve or maintain PFC; if this could not be done the project would be relocated or denied.

Sage grouse priority areas would allow ROWs and other surface disturbing activities with a surface acres disturbance limitation. Surface disturbance would be authorized with a cumulative, direct, and indirect disturbance of no more than 10% of the sagebrush habitat per 640 acres from the point of the disturbance, as long as functional greater sage-grouse habitat and the associated populations were maintained at the same levels as trend areas. Disturbed areas would have to be fully reclaimed to pre-disturbance conditions or to a desired plant community before additional disturbance would be approved. If a realty proposal was submitted and the surface acres limit have not been met, BLM could approve the project; however if the acres are already achieved the project would be put on hold or not approved. This acre cap would hinder realty authorizations; push development onto private land or project abandonment.

Under this alternative, surface-disturbing activities that did not improve greater sage-grouse habitat would require compensation which would increase the cost of the project or prevent the project all together. It could also cause

the project to be relocated on private lands to avoid the enforcement of compensation. Compensation in General Habitat areas would include: 1% surface disturbance cap for greater sage-grouse habitat, 10% surface disturbance cap for greater sage-grouse habitat per section, and a 1:1 Habitat Compensation Ratio. Compensation in the Priority ACEC and Restoration Areas would include: 1% surface disturbance cap for greater sage-grouse habitat, 10% surface disturbance cap for greater sage-grouse habitat per section, and 5:1 Habitat Compensation Ratio.

Acres and percentage of BLM-administered surface within winter occurrence points and greater sage-grouse winter concentration areas in Greater Sage-Grouse Habitat – General, Priority, and Restoration Areas are

unknown and applications for ROWs and other land use authorizations on these lands would be considered on a case-by-case basis.
Allowing prescribed fire on the entire 2.75 million acres of BLM-administered surface in the planning area would protect ROWs and other land use authorization facilities, such as power lines and communication sites, by reducing fuel loads.

Cultural resource management actions under this alternative would increase the cost and time for proposed projects (the average cultural site size with a 300-foot buffer is 39 acres). Avoiding paleontological localities to prevent affecting the quality or setting of the localities would increase the cost and time of proposed projects and reduce ROW and other land use authorization opportunities available to the public. If the surface-disturbing activity could not be avoided, approved mitigation measures (such as applying stipulations or relocation of the project) would be applied, which would result in additional time and costs for the applicant. In some cases, mitigation requirements would cause denial of the proposed project.

See Tables 4-61 and 4-62 for specific resources and special designations that would result in exclusion or avoidance surface acres under Alternative D.

TABLE 4-61
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE D

Area or Resource		Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Fish and Wildlife	Piping Plover Habitat, 0.25-mile buffer	4,350	<1
	Interior Least Tern Habitat, 0.25-mile buffer	10,230	<1
	Pallid Sturgeon, 0.5-mile habitat buffer	15,260	<1
	Greater sage-grouse Habitat – General Habitat Areas, 2-mile lek buffer	341,260	12
	Priority Areas	Unknown*	
VRM	VRM Class I	83,000	4
Special Desig. Areas	Flat Creek paleontological area	50	<1

*** (surface disturbance acre limitation)**

TABLE 4-62
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO AVOIDANCE FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE D

Area or Resource		Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Water	Floodplains, 100-year	42,880	2
Veg.	Riparian and wetland areas	76,350	3
Cult.	300-foot site boundary buffer for mitigation plan	Unknown	
Spec. Design. Areas	Ash Creek, Bug Creek, Sand Arroyo, Black-footed Ferret Reintroduction ACECs	32,000	1

ALTERNATIVE E (Proposed)

Summary Statement

Major ROWs would be allowed on 445,170 acres (16 percent) of the BLM-administered surface in the planning area.

Minor ROWs would be allowed on 1.8 million acres (66 percent) of the BLM-administered surface in the planning area.

Excluding ROWs and other realty-related surface-disturbing or disruptive land use authorizations on approximately 83,600 acres of BLM-administered surface in the planning area (3 percent) would prohibit ROWs and other land use authorizations for proposed projects on these lands. However, some management actions would allow surface-disturbing activities that benefited or maintained specific habitat.

Avoidance of ROWs and other realty-related surface-disturbing or disruptive land use authorizations in greater sage-grouse general habitat and priority areas would occur under this alternative. Major ROWs would be avoided in approximately 2.2 million acres of BLM-administered acres in the planning area (81 percent). Minor ROWs and other realty-related surface-disturbing or disruptive land use authorizations would be avoided in approximately 858,000 acres of BLM-administered acres in the planning area (31 percent).

Implementing avoidance of ROWs or land use authorizations would increase the cost and time of proposed projects, reduce ROW and other land use authorization opportunities available for proposed projects in the planning area, or, in some cases, cause denial of the project. The applicant would also incur additional time and costs if the surface-disturbing activity could not be avoided and approved mitigation measures (such as applying stipulations or relocation of the project) required.

See Table 4-63 and Map 17 for open, excluded and avoided surface acres under Alternative E (overlap of resource restrictions have been dissolved for this alternative analysis).

Resources and Special Designations

If low-voltage powerlines (less than 69 kV) are authorized or if ROWs and other surface-disturbing land use authorizations or disruptive activities are authorized in sensitive soils and rock outcrops, floodplains, perennial or intermittent streams lakes, ponds, or reservoirs, within State designated Source Water Protection Areas, within 300-feet of riparian and wetland areas, areas of invasive species infestations, designated Big Game Crucial Winter Range areas, within 2-miles of the perimeter of sharp-tailed grouse leks, within ½ mile of nesting waterbird rookeries, within Bighorn Sheep Range, within ½-mile of bald eagle nest sites active within the preceding 5 years, within 0.5 mile of raptor nests active within the past 7 years, within ¼ mile of

Piping Plover and Interior Least Tern habitat, within black-tailed prairie dog colonies active within past 10-years, within ¼ mile of highwater mark of Pallid Sturgeon habitat, and adjacent to designated sport-fish reservoirs,, they would be subject to a stipulation that required approved special design features to minimize impacts or improve or maintain PFC; if this could not be done the project would be relocated or denied.

Sage grouse priority areas would be identified as avoidance areas for all ROWs and other surface disturbing activities. Sage grouse general habitat would be identified as avoidance areas for Major ROWs. Due to the importance of these habitat areas, if a realty proposal was submitted BLM and the project proponent would be required to enhance or mitigate the project to provide a net conservation gain to GRSG habitat. If project design and mitigation cannot remove habitat impacts, project authorization could be hindered, push development onto private land or project abandonment.

Under this alternative, surface-disturbing activities would be allowed in the Restoration Areas with required design features to minimize disturbance to sage-grouse habitat which would increase the cost of the project or prevent the project all together. It could also cause the project to be relocated on private lands to avoid the enforcement of compensation.

Allowing prescribed fire on the entire 2.75 million acres of BLM-administered surface in the planning area would protect ROWs and other land use authorization facilities, such as power lines and communication sites, by reducing fuel loads. Surface disturbing activities would be allowed in significant cultural sites and paleontological locations as long as the activities would not have an adverse effect.

TABLE 4-63.
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE E

Stipulation	Surface Acres	Percentage of BLM-Administered Surface in the Planning Area (%)
All ROWs and other LUAs excluded	83,659	3
ROWs and other LUAs avoided:		
Major ROWs	2,222,701	81
Minor ROWs & LUAs	858,073	31
ROWs and other LUAs open:		
Major ROWs	445,170	16
Minor ROWs & LUAs	1,809,798	66

See Tables 4-64 and 4-65 for specific resources and special designations that would result in exclusion or avoidance surface acres under Alternative E.

TABLE 4-64
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE E

Area or Resource		Surface Acres	Percentage of BLM-Administered Surface in the Planning Area (%)
VRM	VRM Class I	83,000	3
Special Desig Areas	Battle Butte Battlefield ACEC (subject to prior existing rights)	320	<1
	Long Medicine Wheel Area	180	<1

TABLE 4-65
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO AVOIDANCE OF ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALTERNATIVE E

Area or Resource		Surface Acres	Percentage of BLM-Administered Surface in the Planning Area (%)
Water	Floodplains	42,000	2
	Waterbodies and streams		
	Waterbodies and streams	12,000	<1
Wildlife	Greater Sage Grouse:		
	General Habitat (Major ROWs)	1,441,000	52
	Priority Areas (Major and Minor ROWs)	817,210	30
Lands with Wilderness Char	Devils Creek	5,240	<1
Rec	Howrey Island (subject to prior existing rights)	550	<1
	Calypso, Lewis and Clark, Matthews Recreation Area, Dean S. Reservoir, Pumpkin Creek Ranch and Recreation Area, Strawberry Hill Recreation Area, and Moorhead Recreation Area	41,000	2
Special Desig. Areas	Reynolds Battlefield ACEC	920	<1
	Bug Creek, Ash Creek, Sand Arroyo, Hoe Site, Big Sheep Mtn, Jordan Bison Kill, Powder River Depot, Seline Site, Cedar Creek Battlefield Area, Flat Creek Paleontological Area, Powderville Paleontological Area, finger Buttes, and Walstein Area	38,000	1

CUMULATIVE IMPACTS

Cumulative impacts to ROWs and other land use authorizations include continued increases in restrictions on ROWs and other land use authorizations, which would limit future ROW projects, other land uses, and reduce rental revenues to the DOI. The cost of constructing ROWs and other land use projects would increase through additional restrictions, which would result in an increase in the cost to applicants and their customers (if customers were being served).

Available locations for ROWs and other projects would also be limited. With the scattered land pattern in the planning area, these restrictions would affect the installation of ROWs and other projects on adjoining lands, such as state, private, and other ownerships. ROWs and other projects on these other lands would have to avoid some BLM-administered lands or would be subject to these restrictions on or crossing BLM-administered lands. Table 4-66 demonstrates the effects of the various restrictions in each alternative and the resulting effect on the number and percentage of available acres for ROW and other land use authorizations.

TABLE 4-66
TOTAL CUMULATIVE BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR ROWS AND OTHER LAND USE AUTHORIZATIONS UNDER ALL ALTERNATIVES

Stipulation	Acres and Percentage of BLM-administered Surface in the Planning Area (%) under each Alternative				
	A	B	C	D	*E
All ROWs and other land use authorizations excluded	128,960 (5)	2,218,290 (81)	682,550 (25)	111,210 (4)	83,659 (3)
ROWs and other land use authorizations avoided;	35,830 (1)	50 (<1)	833,680 (30)	617,320 (22)	
Major ROWs					2,222,701 (81)
Minor ROWs & LUAs					858,073 (31)
ROWs and other land use authorizations open;	2,586,740 (94)	533,200 (19)	1,235,310 (45)	2,023,000 (74)	
Major ROWs					445,170 (16)
Minor ROWs & LUAs					1,809,798 (66)

*** The analysis for Alternative E removed the resource restrictions overlap to depict the actual # of acres of open, avoid and exclude.**

LAND TENURE ADJUSTMENTS (Including Access)

ASSUMPTIONS AND METHODOLOGY

It is assumed that approximately 30,000 acres of BLM-administered land would be disposed of and approximately 30,000 acres acquired through land tenure adjustment in the long-term.

There would be continued disposal of BLM-administered land and acquisition of nonfederal lands or interests through sales, exchanges, transfers, direct purchases, donations, and withdrawals on a case-by-case basis. There are approximately 2.4 million BLM-administered acres identified for retention or retention with limited disposal and 320,000 acres identified as available for disposal in the planning area. The acquisition emphasis would be alternative dependent and vary according to objectives, resource values, economic values, access, or developable resources. The management of cultural and paleontological resources, biological resources, and special designation areas would limit or prevent disposal and acquisition actions or provide the justification

for the action. There would be a continued demand, both internal and external, for land tenure adjustments to improve the manageability of federal and nonfederal lands. Land exchanges would continue to be the preferred method of land tenure adjustment. Based on the relative differences in appraised values between BLM-administered and nonfederal lands, a net loss of BLM-administered acres in most exchange transactions would be expected.

Land identified for disposal would usually go into state or private ownership and be used for its highest and best use (residential, commercial, industrial, agricultural, or public purposes).

There would be one access easement acquired by the BLM per year. Any disturbance would be on nonfederal lands.

Demand for adequate access (the physical ability and legal right of the public, agency personnel, and authorized users to reach public lands) is expected to remain high. Easement acquisition would be the primary means of acquiring access where needed.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources, reviews of existing literature, information from BLM records, and information provided by other agencies and institutions. To analyze the potential impacts of the alternatives on the lands and realty program, information was gathered from administrative files for lands and realty actions in the planning area and other resource programs. The analysis is also based on the MCFO realty specialist's knowledge of the area and the professional expertise of BLM specialists at the MCFO and the Montana State Office. Impacts are quantified where possible but, in the absence of quantitative data, best professional judgment was used.

IMPACTS COMMON TO ALL ALTERNATIVES

Management actions to protect air, soils, and water quality would impact BLM actions to obtain legal and physical access to public lands. Impacts from facilities and actions would need to be mitigated (such as with specialized design features), sited in acceptable alternative locations, or in some cases, eliminated from consideration. As a result of these management actions, the BLM would incur delays and greater costs for project development.

Protective management actions or those that required inventories for special status species or their habitat would increase the cost and time of processing proposed disposal actions. These management actions would eliminate some lands from consideration for disposal.

Vegetation (including hardwood draws) and fish and wildlife (including aquatics) management actions, actions to protect special status species (and other species requiring special protections), and actions to protect riparian and wetland vegetation would impact land tenure adjustments and acquisition of legal and physical access to public lands. Impacts from facilities proposed for access easements in these areas would need to be mitigated (such as with specialized design features), constructed in alternate locations, or in some cases, eliminated from consideration. These types of actions would increase processing costs and time for both the BLM and the proponent. In some cases (such as to protect certain vegetation types), land tenure adjustments such as exchanges or sales would be restructured or eliminated from consideration. As a result, the BLM would incur time delays and greater costs for project development.

Requiring surveys for black-footed ferrets would result in added restrictions to proposed access easement projects, force construction in alternate locations, or, in some cases, eliminate the project from consideration. In some cases, land tenure adjustments (such as exchanges or sales proposed for potential black-footed ferret habitat areas) would be restructured or eliminated from consideration. As a result, the BLM would incur delays and increased processing costs for the proposed project.

Management of cultural resources would impact land tenure adjustments and the acquisition of legal and physical access to BLM-administered lands. Because these lands and realty actions are considered federal undertakings, inadvertent damage to federal and nonfederal cultural resources must be avoided through compliance with Section 106 of NHPA. Cultural inventories would need to be completed prior to these

federal undertakings, and impacts to important cultural sites would need to be avoided by project redesign, project abandonment, or mitigation through data recovery. These requirements would result in actions such as the rerouting of proposed access road easements or the restructuring or abandoning of proposed land tenure adjustments (such as a land exchange or sale). Under Impacts Common to all Alternatives, land tenure adjustments would also be used to acquire lands with important cultural resources. Consultation with American Indian Tribes would increase processing costs and time for both the federal and nonfederal parties.

Impacts from the management of paleontological resources under Impacts Common to all Alternatives would be similar to those described for cultural resources. Lands and realty projects occurring in known fossil-bearing areas would require allocation of adequate time and resources to conduct resource inventories. The discovery of scientifically important paleontological resources would result in project abandonment, mitigation through scientific recovery and analysis, or the rerouting or redesign of the easement facilities. The presence of these resources would also result in the restructuring or abandonment of land tenure adjustments (such as land exchanges or sales). Land tenure adjustments would also be used to acquire lands with important paleontological resources. The result of such actions would increase processing costs and processing time for both the federal and nonfederal parties.

In some cases, the use or sale of forestry and woodland products would result in the need for BLM acquisition of easements for legal and physical access to public lands, which would increase time and costs for the BLM.

BLM access easements occasionally require mitigation (which would include exclusion or elimination of livestock grazing during the construction and rehabilitation phases of the project) in areas in which livestock grazing occurs. This mitigation would be required to facilitate livestock movement or provide for public safety (e.g., fencing and cattleguards). As a result, the BLM would incur time delays and greater costs for project development.

Travel Management and OHV management actions under all alternatives would require that easements or permits be acquired for any BLM-administered road or other types of facilities located on nonfederal lands. As a result, the BLM would incur time delays and greater costs for project development.

Recreation (including designation of SRMAs), Back Country Byways, and National Trails management actions would result in the need for land tenure adjustments, easements, or permit acquisitions to improve access to public lands for recreation opportunities. As a result, the BLM would incur time delays and greater costs for project development.

Managing the Lewis and Clark National Historic Trail segment within the planning area to protect the values that prompted its designation would impact BLM actions to obtain legal and physical access to public lands. Impacts from facilities proposed for access easements would need to be mitigated (such as with specialized design features), constructed in alternate locations, or, in some cases, eliminated from consideration to reduce impacts to trails and protect trail values. In some cases, land tenure adjustments such as sales or exchanges would need to be restructured or eliminated from consideration to avoid disposal of public lands that contained important trail segments. Land adjustment actions would potentially also be used to acquire lands with important trail segments.

Transportation and facilities management actions would require easements or permits for any BLM-administered roads or other types of facilities proposed on nonfederal lands. As a result, the BLM would incur time delays and greater costs for project development.

In some cases, rerouting, closing, or decommissioning existing roads, primitive roads, or trails that substantially contributed to resource impacts would result in the loss or restriction of access to tracts of BLM-administered land.

There would be continued demand from both inside and outside the BLM for land ownership adjustment to improve the manageability of the federal and nonfederal lands. Land exchanges would be the BLM’s preferred method of land tenure adjustment. The BLM would expect that there would be a net loss of federal land

resulting from the relative difference in values between federal and nonfederal lands. The lands identified for disposal would usually go into private or state ownership and would be used for the highest and best use such as residential, commercial, agricultural, industrial, or public purposes.

Consideration of land tenure adjustments on a case-by-case basis would allow for flexibility in managing public lands to achieve improved management efficiency or enhance other programs. Proposals would be considered to obtain inholdings within existing or future SRMAs, ACECs, back country byways, national trails, WSAs, and other designated areas or to obtain adjoining lands that expanded the areas. Actions such as exchanges, sales, and purchases would adjust the relatively fragmented public land pattern to better manage the public lands and resources. All land exchanges would be restricted to lands within Montana, and land tenure adjustments would be on a willing buyer and willing seller basis unless required by law, regulation, court order, or Congressional action. Consolidation of public land holdings would facilitate access to and throughout public lands to benefit the public land users.

Managing 83,000 acres in the planning area in as Category 1 retention lands would be precluded from disposal from any method, resulting in protection of resource values associated with those lands. Not having these lands available for land ownership adjustment would have a minor impact on the lands and realty program since the vast majority of these lands are already unavailable for such use because of law, regulation or policy. Designating these lands as Category 1 retention lands with no disposal would put the public on notice that they are unavailable for land adjustments. The acreage in Category 2 provides the flexibility in adjustments of land ownership to meet resource objectives and to meet other parties' objectives. The Category 3 lands that targeted specifically for disposal would result in better management of the public lands over the long-term as parcels that are isolated and difficult to manage are transferred from BLM management.

Coal exchanges would be considered for existing leases, by direction of legislation, and for leases for federal coal or fee-held coal located in alluvial valley floors. Consolidation of public land holdings would reduce encroachment problems on public lands from adjacent property owners and land users, facilitate access to public lands, and reduce the number of access easements needed. Access to public lands would be improved by the pursuit of land exchanges, easement acquisitions, and land donations. Allowing exercise of the right of eminent domain to secure access to public lands would allow facilitation of access in difficult situations in which no other options exist and access is critical.

Lands that meet Recreation and Public Purposes Act (R&PP) classification criteria for public purposes would be considered for acquisition by state and local governments and other qualified organizations on a case-by-case basis, which would assist those entities in meeting the need for reasonably priced land to serve that serves a broad array of public needs. Other types of entry would also be considered on a case-by-case basis.

Reviewing existing withdrawals and revoking those no longer serving their intended purpose would prevent unnecessarily encumbered lands and ensure that BLM-administered lands would remain open to the widest possible array of public land uses that were consistent with other resource needs. Such reviews would also ensure that withdrawals still serving their intended purpose remained in place. New withdrawal proposals would be limited to the minimum restrictions and area required for the intended use, require strong justification, and be initiated only where applicable alternative prescriptions were inadequate to protect the resource values.

A decision to withdraw or continue lands for locatable mineral entry would be made based on the determination of the validity of mining claims staked for locatable minerals within SRMAs, ERMAs, special designation areas, and ACECs. If locatable mineral potential were found to be high with at least a medium degree of certainty on any or all of the lands and it was determined that the lands should be withdrawn from mineral entry, the lands subject to these restrictions would be petitioned for locatable mineral withdrawal (only the minimum acreage needed would be petitioned for withdrawal). If the withdrawal petition were approved, additional acres would be withdrawn within the planning area.

Managing WSAs under BLM Manual 6330 would prevent the disposal of any lands within WSAs. The 83,000 acres in WSAs would be part of the retention area and impact 3 percent of the BLM-administered surface in the

planning area. Proposals would be considered to obtain inholdings within the WSAs or lands adjoining the WSAs that expanded the WSAs.

Inventorying lands for hazardous materials would result in additional costs and time for the BLM to complete the proposed land adjustment. The presence of hazardous materials would be subject to the modification or abandonment of a landownership adjustment proposal or remediation (in the form of cleanup and removal of the contaminants). The BLM would not acquire contaminated land except at the direction of Congress or for good cause and in compliance with United States Department of the Interior policy.

ALTERNATIVES A-E

All impacts are addressed in the *Impacts Common to All Alternatives* Section and the same alternative analysis under the *Land Use Authorizations* Section.

CUMULATIVE IMPACTS

See *Cumulative Impacts* under the *Land Use Authorizations* Section for impact analysis.

RENEWABLE ENERGY (Wind and Solar)

ASSUMPTION AND METHODOLOGY FOR ALL ALTERNATIVES

The BLM encourages the development of wind and solar energy within acceptable areas, consistent with the Energy Policy Act of 2005 (Public Law 109-58) and the BLM Energy and Mineral Policy (BLM 2008a). The demand for renewable energy development on public lands within the planning area (particularly for wind and possibly solar resources) would increase, provided both the technological and economic climate for these uses improved. As energy costs increased, the potential for co-generation facilities, in which alternative energy sources supplement traditional sources, would also be expected to increase.

Any renewable energy wind or solar developments proposed for public lands managed by the MCFO would result in requests for ROWs. Military training routes, military operating areas, steep slopes, timbered areas, and wildlife habitat areas for species such as greater sage-grouse and bald and golden eagles would influence the selection of proposed sites for renewable energy projects.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources, reviews of existing literature, BLM records, and information provided by other agencies and institutions. Much of the impact analysis in this section are those found in the *Land Use Authorizations* Section of this document and will be reference accordingly. To analyze the potential impacts of the alternatives on renewable energy resources, information was gathered from administrative files for lands and realty actions in the planning area and other resource programs. The analysis is also based on the professional expertise of BLM specialists at the MCFO and Montana State Office (including realty specialists).

Although ROW avoidance areas are lands that must be avoided when implementing ROWs, these areas may be available for location of ROWs with special stipulations. ROW exclusion areas are lands that would not be available for ROW locations under any conditions. Impacts are quantified where possible but, in the absence of quantitative data, best professional judgment is used and the impacts qualified.

Exclusion and avoidance acres for ROWs and other surface-disturbing or disruptive land use authorizations for Alternatives A, B, C, D, E were determined using GIS to allow for the overlap of the various resource management actions. Avoidance acres overlap with excluded areas were removed from the acres under the *Program Management* heading.

ASSUMPTIONS AND METHODOLOGY

Based on potential wind resources in the planning area and current development on private lands as described in Chapter 3, it is projected there would be one ROW issued for a utility-scale (defined as any project that proposes to generate electricity that enters the electric transmission grid, according to BLM's 2008 IM 2009-013) wind energy project in the planning area in the short-term and seven ROWs issued for utility-scale wind energy projects in the long-term. Each project would result in surface disturbance of 25 acres. During staging and construction, it is assumed that each wind energy turbine would disturb 2 to 3 acres with a minimum of 25 turbines, each with a capacity of 1.5 megawatts, which would result in 50 to 75 acres of short-term surface disturbance for each project. In the long-term, there would be one ROW issued for a utility-scale solar energy project in the planning area (with a surface disturbance of 500 acres). See *Disturbance Appendix*, Table 1, for assumed disturbance acres per alternative based on % of the planning area with resource restrictions.

IMPACTS COMMON TO ALL ALTERNATIVES

Managing BLM-administered lands to protect air, soils, water quality, vegetation (including hardwood draws, special status plant species, and riparian and wetland areas), wildlife, fisheries, and other aquatic habitat (including special status wildlife species habitat), cultural and paleontological resources, visual resources, special designation areas, and WSAs would impact the issuing of renewable energy ROWs in the planning area.

In areas that are not excluded from development, proposals for renewable energy ROWs would be evaluated on a case-by-case basis. Past studies have found a 1 to 4.5 percent reduction in wind speeds associated with climate change over a 100-year period. One study that investigated scenarios of climate change impacts on wind power generation potential in a five-state region within the Northwest United States (including a site at Great Falls, Montana) suggested that summertime wind speeds in the Northwest may decrease by 5 to 10 percent, while wintertime wind speeds may decrease by relatively little, or possibly increase slightly. The studies project results much further into the future than what can be analyzed in this plan, but the studies would suggest that there would be little to no effects to wind energy from climate change in the next 20 years. (Sailor, Smith, and Hart 2008). Impacts from the facilities and actions authorized under renewable energy ROWs would need to be mitigated by actions such as the application of restrictions or relocation to acceptable alternative locations. In some cases, the proposed project would be denied. Renewable energy activities would not be expected to impact climate change because of period analyzed in this plan; however, it is possible that there would be limited impacts caused by renewable energy projects replacing other type of energy facilities. BMPs would be used on such projects. As a result of these impacts and required inventories, applicants for such proposals would incur time delays and greater costs for project development. In some cases, with appropriate justification and documentation, the authorized officer may modify or waive a management action or determine the project would be exempt from a management action, which would result in some flexibility in the location of the proposed project.

Applicants for renewable energy ROWs would incur time delays and greater costs for project development as a result of the following management actions: requiring inventories for various resources, requiring distance and timing stipulations for various wildlife species (there is potential for a project to be delayed from December 1 through August 1 by timing stipulations), following the most recent guidance from the Avian Power Line Interaction Committee, currently 2012(APLIC 2012), for overhead power lines, requiring equipment to be power-washed, requiring Section 7 consultation, requiring cultural resource surveys and Section 106 consultation for NHPA and consultations with interested tribes and American Indian Tribes as Sovereign nations, and requiring surveys for black-footed ferrets prior to surface disturbance for wind or solar ROWs in black-footed ferret habitat. Additionally, surveying of black-footed ferret habitat would result in restrictions for the proposed project, relocation of construction, or, in some cases, cause denial of the project.

In conformance with BLM policy, the Lewis and Clark National Historic Trail would be excluded from wind energy and solar ROWs but is addressed under the various alternatives to reflect acre changes. Managing 83,000 acres of land within the five WSAs as exclusion areas for wind and solar ROWs as outlined in BLM policy would prevent development of 3 percent of the BLM-administered surface in the planning area.

Managing areas as avoidance areas for renewable energy ROWs, especially in high wind potential areas, would limit opportunities for renewable energy development in the planning area by increasing costs and processing time if applications were submitted. Applicants would incur time delays and greater costs for project development in areas with inventory or mitigation needs. Restrictions on facility placement, limited access, increased administrative costs, and installation of facilities in less-than-optimum sites could all result if applicants applied for authorizations in avoidance areas. Placement or operation of turbines to avoid resources of concern or mitigate impacts (such as increasing cut-in speeds or other measures) would result in less-than-optimum generation. In some instances, an area that is not closed to wind would become uneconomical to develop due to the cost of implementing mitigation measures and the decrease in general potential. Areas managed as avoidance areas under all alternatives would include the Big Sheep Mountain, Hoe, Jordan Bison Kill, Powder River Depot, Seline and Finger Buttes ACECs on a total of 3,672 acres, less than 1 percent of BLM-administered surface acres in the planning area. Other ACECs are addressed individually by alternative.

Renewable energy ROW facilities would need to meet objectives for the particular VRM class in which a project was proposed; actions required would include mitigation (such as applying restrictions), relocation, or elimination of certain facilities; all of which would result in additional time and costs in project development. ROWs for wind and solar projects would be excluded on VRM Class I areas and potentially be excluded on VRM Class II lands (if allowed in these areas, ROWs would be subject to restrictive mitigation measures, which would be cost prohibitive at times). Visual resources restrictions would reduce lands available for wind and solar projects by 83,000 acres, approximately 3 percent of the BLM-administered surface in the planning area.

The management and location of leasable, mineral materials, and locatable minerals projects would cause the possible relocation of wind and solar projects or necessitate implementation of other mitigation measures (such as applying restrictions or special project design) to eliminate conflict with other authorized uses. As a result, applicants for such proposals would incur time delays and greater costs for project development.

SRMA designation and Recreation, and Back Country Byways management actions would require mitigation of renewable energy wind and solar ROWs, require relocation of the ROWs, or, in some cases, cause denial of the project. These management actions would cause delays and greater project development costs for proposal applicants and are addressed further under the various alternatives.

Fire and fuels management would generally help protect renewable energy facilities authorized by ROWs by reducing fuel loads and suppressing fires.

Requests for ROWs for proposed renewable energy wind and solar projects would be considered on a case-by-case basis (with appropriate stipulations applied to protect resource values) and processed and authorized as ROWs under Title V of FLPMA and Title 43, Part 2800, of the CFR. Projects would need to be consistent with resource management goals and mitigated or relocated in some cases. Wind and solar energy exploration and development authorization would be subject to the same laws, regulations, and guidance as other commercial ROWs. The DOE's National Renewable Energy Laboratory maps and information would be used when considering and evaluating wind and solar project proposals and applications. Renewable energy ROWs would be subject to BMPs and policies related to renewable energy development, including, but not limited to, programmatic policies and BMPs in the Wind Energy Development Program (BLM 2005c and 2005f) BMPs see Attachment 1 of BLM's 2008 WO IM 2009-043; (for policies see the *Lands and Realty-Renewable Energy Appendix*) and additional BLM guidance found at: http://www.blm.gov/wo/st/en/prog/energy/renewable_energy.html. The policies and BMPs from BLM's 2008 IM 2009-043 are applicable to all wind energy development projects on BLM-administered public lands. These policies address the administration of wind energy development activities, and the BMPs identify required mitigation measures that would be incorporated into project-specific plans of development and ROW authorization stipulations. Additional mitigation measures would be applied to individual projects, in the form of stipulations in the ROW authorization as appropriate, to address site-specific and species-specific issues.

The planning area includes approximately 550,000 acres rated in Wind Power Class 4 or above as determined by the National Renewable Energy Laboratory. Class 4 areas and above are considered good resources for wind energy. Class 3 areas may be suitable for utility-scale wind development.

Requests for solar energy project ROWs would be processed according to BLM's 2010 WO IM 2011-003 and any future BLM guidance. BMPs from the *Solar Energy Development Programmatic Environmental Impact Statement*, which was approved by the Secretary of Interior on October 12, 2012, and was prepared by the DOE Energy Efficiency and Renewable Energy Program and the BLM for six western states (Arizona, California, Colorado, New Mexico, Nevada, and Utah), would also be used for processing solar ROW applications (for more information, see http://solareis.anl.gov/). The study area was limited to these six states because they include the greatest prospective solar energy resources suitable for utility-scale development over the next 20 years. As a result, applicants for such proposals would incur time delays and greater costs for project development, or, in some cases, the application would be denied. As a result of these requirements, wind and solar projects would be excluded from lands that are part of the National Landscape Conservation System (e.g., wilderness areas, WSAs, national monuments, national conservation areas, and national historic and scenic trails) and overall lands available for wind and solar projects would be reduced.

Market demand would drive the development and proposals for renewable energy ROWs for wind and solar projects. Because the BLM encourages renewable energy development, the BLM would attempt to accommodate the demand for such projects and facilitate a clean energy future by providing sites for environmentally sound development of renewable energy on public lands, assisting to diminish dependence on foreign sources of oil, and providing an opportunity to create new jobs to support local communities.

Renewable energy ROWs that involved hazardous materials would be subject to the appropriate stipulations and bonding, which would protect the lands and environment. The bond requirement would provide assurance that any potential accidental hazardous materials occurrence would undergo proper cleanup. Unauthorized uses of public land would be resolved in an expeditious manner and result in continued use under short-term authorizations in some circumstances.

Exclusion of portions of the planning area, and in some instances, mitigation restrictions in avoidance areas would have the potential to affect proposals on non-BLM-administered lands if facilities or development were contingent on public land availability and authorization. The areas that lie outside of the exclusion and avoidance areas would provide the best opportunity for generation of renewable energy to meet agency goals and potentially assist in reducing reliance on other energy sources and, in turn, reduce emissions from other generating sources. Impacts from specific management actions that would apply to renewable energy development are summarized under each alternative to indicate the percentage of the area affected. The exclude and avoid acres under Impacts Common to all Alternatives are not included in the analysis of the various alternatives below.

ALTERNATIVE A (No Action)

Summary Statement

Renewable energy ROWs would be allowed with few or no restrictions on 2.6 million open acres (94 percent) of the BLM-administered surface in the planning area, and allowed on 527,600 open acres (97 percent of the approximate 550,000 acres) of the Wind Power Class 4 and above. Potential Wind Development Areas (where wind energy project ROW applications would be considered) were not developed under Alternative A.

Renewable energy ROWs for wind and solar projects would be excluded on 128,960 acres (5 percent), limiting implementations at certain times or prohibit proposed projects on BLM-administered lands in the planning area. ROWs for wind energy projects would be excluded on 12,720 acres (2 percent) rated in Wind Power Class 4 and above. This alternative would leave approximately 98 percent of Class 4 and above available for potential wind power projects (some of the excluded acres would be subject to a timing stipulation and available only during specific periods). These actions would prohibit ROWs or limit implementation of ROWs for wind and solar projects at certain times.

Renewable energy ROWs for wind and solar projects would be avoided on 35,830 acres of BLM-administered surface within the planning area and ROWs for wind energy projects would be avoided on 6,390 acres (1 percent) rated in Wind Power Class 4 and above. These actions would increase the cost and time of proposed projects and reduce ROWs available to the public for wind and solar projects. In some cases, these actions would result in denial of the proposed project. Management actions that required avoidance of specific areas would impact 2 percent of the BLM-administered surface in the planning area.

See Table 4-67 for Renewable Energy open, excluded and avoided surface acres under Alternative A.

TABLE 4-67.
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR RENEWABLE ENERGY ROWS UNDER ALTERNATIVE A

Stipulation	BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Renewable energy ROWs excluded	128,960	5
Class 4 and above Wind energy ROWs excluded	*12,720*	*2*
Renewable energy ROWs avoided	35,830	1
Class 4 and above Wind energy ROWs avoided	*6,390*	*1*
Renewable energy ROWs open	2,586,740	94
Class 4 and above Wind energy ROWs open	*527,600*	*97*

ALTERNATIVE B

Summary Statement

Renewable energy ROWs would be allowed with few or no restrictions on 533,200 open acres (19 percent) of the BLM-administered surface in the planning area and allowed on 116,510 open acres (21 percent of the approximate 550,000 acres) of the Wind Power Class 4 and above.

Renewable energy ROWs for wind and solar projects would be excluded on 2.2 million acres of BLM-administered surface in the planning area, and ROWs for wind energy projects (including associated aboveground power lines) would be excluded on 430,640 acres (79 percent) rated in Wind Power Class 4 and above. This alternative would leave approximately 21 percent of Class 4 and above available for potential wind power projects. These actions would prohibit ROWs or limit implementation of ROWs for wind and solar projects at certain times. Exclusion restrictions under this alternative would impact 81 percent of the BLM-administered surface in the planning area. (These acres do not include invasive species acres or cultural and paleontological 0.5-mile buffers).

Avoiding renewable energy ROWs for wind and solar projects on 50 acres of BLM-administered surface and avoiding ROWs for wind energy projects on 0 acres rated in Wind Power Class 4 and above, would increase the cost and time of proposed projects, reduce ROWs for wind and solar projects available to the public, and, in some circumstances, cause the denial of the proposed project. If the surface-disturbing activity would not or could not be avoided, approved mitigation measures (such as applying restrictions or relocating the project) would be applied to reduce the impacts to the resource; however, mitigation activities would add additional time and costs for the applicant. Avoidance restrictions on BLM-administered surface acres would impact less than 1 percent of the BLM-administered surface in the planning area.

See Table 4-68 for Renewable Energy open, excluded and avoided surface acres under Alternative B.

TABLE 4-68
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR RENEWABLE ENERGY ROWS UNDER ALTERNATIVE B

Stipulation	BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Renewable energy ROWs excluded	2,218,290	81
Class 4 and above Wind Energy ROWs excluded	*430,640*	*79*
Renewable energy ROWs avoided	50	<1
Class 4 and above Wind Energy ROWs avoided	*0*	*0*
Renewable Energy ROWs open	533,200	19
Class 4 and above Wind Energy ROWs open	*116,510*	*21*

ALTERNATIVE C

Summary Statement

Renewable energy ROWs would be allowed with few or no restrictions on 1,235,310 open acres (45 percent) of the BLM-administered surface in the planning area, and allowed on 299,270 open acres (55 percent of the approximate 550,000 acres) of the Wind Power Class 4 and above.

Excluding renewable energy ROWs for wind and solar projects on 682,550 acres of BLM-administered surface, and excluding ROWs for wind energy projects (including associated aboveground power lines) on 89,340 acres (16 percent) rated in Wind Power Class 4 and above, would prohibit (unless the projects would benefit the habitat or maintain the functionality of the specific habitat) ROWs for wind and solar projects in these areas, leaving 84 percent of Class 4 and above available for potential wind power projects. These restrictions would impact 25 percent of the BLM-administered surface in the planning area. (These acres do not include the sage grouse priority habitat surface disturbance acre limitation and the cultural and paleontological site and locality 300-foot boundary buffers).

Avoiding renewable energy ROWs for wind and solar projects on 833,680 acres of BLM-administered surface and avoiding ROWs for wind energy projects on 158,540 (29 percent) acres rated in Wind Power Class 4 and above, would increase the cost and time of proposed projects, reduce ROWs for wind and solar projects available to the public, and, in some circumstances, cause the denial of the proposed project. If the surface-disturbing activity would not or could not be avoided, approved mitigation measures (such as applying restrictions or relocating the project) would be applied to reduce the impacts to the resource; however, mitigation activities would add additional time and costs for the applicant. Avoidance restrictions on BLM-administered surface acres would impact 30 percent of the BLM-administered surface in the planning area.

See Table 4-69 for Renewable Energy open, excluded and avoided surface acres under Alternative C.

All impacts are addressed in the *Impacts Common to All Alternatives* Section and the same alternative analysis under the *Land Use Authorizations* Section and Tables.

TABLE 4-69
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR RENEWABLE ENERGY ROWS UNDER ALTERNATIVE C

Stipulation	BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Renewable energy ROWs excluded	682,550	25
Class 4 and above Wind Energy ROWs excluded	*89,340*	*16*
Renewable energy ROWs avoided	833,680	30
Class 4 and above Wind Energy ROWs avoided	*158,540*	*29*
Renewable Energy ROWs open	1,235,310	45
Class 4 and above Wind Energy open	*299,270*	*55*

ALTERNATIVE D

Summary Statement

Renewable energy ROWs would be allowed with few or no restrictions on 2 million open acres (74 percent) of the BLM-administered surface in the planning area, and allowed on 447,010 open acres (81 percent of the approximate 550,000 acres) of the Wind Power Class 4 and above.

Excluding renewable energy ROWs for wind and solar projects on 111,210 acres of BLM-administered surface, and excluding ROWs for wind energy projects (including associated above ground power lines) on 4,500 acres (1 percent) rated in Wind Power Class 4 and above, would prohibit (unless they would benefit or maintain the functionality of the specific habitat) ROWs for wind and solar projects in these areas, leaving 99 percent of Class 4 and above available for potential wind power projects. (These acres do not include the sage grouse priority habitat surface disturbance acre limitation). Exclusion restrictions on BLM-administered surface in the planning area would impact 4 percent of the BLM-administered surface.

Avoiding renewable energy ROWs for wind and solar projects on 617,320 acres of BLM-administered surface and avoiding ROWs for wind energy projects on 95,650 (18 percent) rated in Wind Power Class 4 and above, would increase the cost and time of proposed projects, reduce ROWs for wind and solar projects available to the public, and in some cases, cause denial of the proposed project. (These acres do not include cultural resource 300-foot site boundary buffers or paleontological locality buffers.) If the surface-disturbing activity could not be avoided, applying approved mitigation measures would add additional time and costs for the applicant. Avoidance restrictions on BLM-administered surfaces would impact 22 percent of the BLM-administered surface in the planning area.

See Table 4-70 for Renewable Energy open, excluded and avoided surface acres under Alternative D.

All impacts are addressed in the *Impacts Common to All Alternatives* Section and the same alternative analysis under the *Land Use Authorizations* Section and Tables.

**TABLE 4-70.
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED
FOR RENEWABLE ENERGY ROWS
UNDER ALTERNATIVE D**

Stipulation	BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Renewable energy ROWs excluded	111,210	4
Class 4 and above Wind energy ROWs excluded	*4,500*	*<1*
Renewable energy ROWs avoided	617,320	22
Class 4 and above Wind Energy ROWs avoided	*95,650*	*18*
Renewable energy ROWs open	2,023,000	74
Class 4 and above Wind Energy Rows open	*447,010*	*81*

ALTERNATIVE E (Proposed)

Summary Statement

Renewable energy ROWs would be allowed with few or no restrictions on nearly 350,000 open acres (13 percent) of the BLM-administered surface in the planning area and allowed on 37,000 open acres (7 percent of the approximate 550,000 acres) of the Wind Power Class 4 and above. Excluding renewable energy ROWs for wind and solar projects on approximately 1 million acres of BLM-administered surface, and excluding ROWs for wind energy projects on 280,000 acres (51 percent) rated in Wind Power Class 4 and above, would prohibit ROWs for wind and solar projects in these areas, leaving 49 percent of Class 4 and above available for potential wind power projects. These restrictions would impact 36 percent of the BLM-administered surface in the planning area.

Avoiding renewable energy ROWs for wind and solar projects on 1.4 million acres of BLM-administered surface, and avoiding ROWs for wind energy projects on 228,000 (42 percent) acres rated in Wind Power Class 4 and above, would increase the cost and time of proposed projects, reduce ROWs for wind and solar projects available to the public, and, in some circumstances, cause the denial of the proposed project. If the surface-disturbing activity would not or could not be avoided, approved mitigation measures (such as applying restrictions or relocating the project) would be applied to reduce the impacts to the resource; however, mitigation activities would add additional time and costs for the applicant. Avoidance restrictions on BLM-administered surface acres would impact 51 percent of the BLM-administered surface in the planning area.

See Table 4-71 for Renewable Energy open, excluded and avoided surface acres under Alternative E (overlap of resource restrictions have been dissolved for this alternative analysis).

**TABLE 4-71
TOTAL BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR
RENEWABLE ENERGY ROWS UNDER ALTERNATIVE E**

Stipulation	BLM-administered Surface Acres	Percentage of BLM-administered Surface in the Planning Area (%)
Renewable energy ROWs excluded	1,002,687	36
Class 4 and above Wind Energy ROWs excluded	*282,401*	*51*
Renewable energy ROWs avoided	1,400,514	51
Class 4 and above Wind Energy ROWs avoided	*227,727*	*42*
Renewable Energy ROWs open	348,329	13
Class 4 and above Wind Energy open	*37,028*	*7*

Resources and Special Designations

Under this alternative renewable energy ROWs are excluded in sage grouse PPAs and restoration habitat; thus these types of realty actions cannot be approved in this area. If a realty proposal was submitted BLM would deny the project; perhaps resulting in the renewable project being pushed onto private land or overall abandonment; see Table 4-72.

Sage grouse General Habitat would be identified as avoidance areas for all Renewable Energy ROWs. Due to the importance of these habitat areas, if a renewable energy proposal was submitted BLM, the project proponent would be required to enhance or mitigate the project to eliminate adverse effects to the habitat. If project design and mitigation cannot remove habitat impacts, project authorization could be hindered, push development onto private land or project abandonment.

All other impacts are addressed in the *Impacts Common to All Alternatives* Section and the same alternative analysis under the *Land Use Authorizations* Section and Tables.

CUMULATIVE IMPACTS

Cumulative impacts to renewable energy ROWs include continued increases in restrictions on renewable energy development, which would limit future development. The cost of developing renewable energy would increase through additional restrictions, resulting in an increase in the cost of that energy to the energy companies and their customers. Available locations for renewable energy development would also be limited. With the scattered land pattern in the planning area, these restrictions would affect the development of renewable energy on adjoining lands, such as state, private, and other ownerships. Projects on these other lands would have to avoid some BLM-administered lands or would be subject to these restrictions on or crossing BLM-administered lands. Table 4-74 demonstrates the effects of the various restrictions in each alternative and the resulting effect on the number and percentage of available acres for renewable energy development.

See *Cumulative Impacts* under the *Land Use Authorizations* Section for impact analysis.

TABLE 4-72.
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO EXCLUSION OF RENEWABLE ENERGY ROWS UNDER ALTERNATIVE E

	Area or Resource	Surface Acres	Percentage of BLM-Administered Surface in the Planning Area (%)
Fish and Wildlife	Greater sage grouse:		
	Priority Areas	817,000	30
	Restoration Areas	87,000	3
VRM/ WSAs	VRM Class I/WSAs	83,000	3
Lewis & Clark Trail	Lewis and Clark NHT	14,500	<1
Special Desig Areas	Battle Butte Battlefield ACEC (subject to prior existing rights)	320	
	Long Medicine Wheel Area	180	<1

TABLE 4-73
BLM-ADMINISTERED SURFACE ACRES SUBJECT TO AVOIDANCE OF RENEWABLE ENERGY ROWS UNDER ALTERNATIVE E

Area or Resource		Surface Acres	Percentage of BLM-Administered Surface in the Planning Area (%)
Water	Floodplains	42,000	2
	Waterbodies and streams	12,000	<1
Wildlife	Greater Sage Grouse: General Habitat	1,441,000	52
Lands w/wilderness Char	Devils Creek	5,240	<1
Rec.	Howrey Island (subject to prior existing rights)	550	<1
	Calypso, Matthews Recreation Area, Dean S. Reservoir, Pumpkin Creek Ranch and Recreation Area, Strawberry Hill Recreation Area, and Moorhead Recreation Area	26,500	2
Special Desig. Areas	Reynolds Battlefield ACEC	920	<1
	Bug Creek, Ash Creek, Sand Arroyo, Hoe Site, Big Sheep Mtn., Jordan Bison Kill, Powder River Depot, Seline Site, Cedar Creek Battlefield Area, Flat Creek Paleontological Area, Powderville Paleontological Area, Finger Buttes, and Walstein Area	38,000	1

TABLE 4-74
TOTAL CUMULATIVE BLM-ADMINISTERED SURFACE ACRES AFFECTED FOR RENEWABLE ENERGY ROWS UNDER ALL ALTERNATIVES

Stipulation	Acres and Percentage of BLM-administered Surface in the Planning Area (%)				
	Alternative A	Alternative B	Alternative C	Alternative D	*Alternative E
Renewable Energy ROWs Excluded	128,960 (5)	2,218,290 (81)	682,550 (25)	111,210 (4)	1,002,687 (36)
Class 4 and Above Wind Energy ROWs Excluded	*12,720 (2)*	*430,640 (79)*	*89,340 (16)*	*4,500 (<1)*	*282,401 (51)*
Renewable Energy ROWs Avoided	35,830 (1)	50 (<1)	833,680 (30)	617,320 (22)	1,400,514 (51)
Class 4 and Above Wind Energy ROWs Avoided	*6,390 (1)*	*0 (0)*	*158,540 (29)*	*95,650 (18)*	*227,727 (42)*
Renewable Energy ROWs Open	2,586,740 (94)	533,200 (19)	1,235,310 (45)	2,023,000 (74)	348,329 (13)
Class 4 and Above Wind Energy ROWs Open	*527,600 (97)*	*116,510 (21)*	*299,270 (55)*	*447,010 (81)*	*37,028 (7)*

*** The analysis for Alternative E removed the resource restrictions overlap to depict the actual # of acres of open, avoid and exclude.**

SPECIAL DESIGNATION AREAS

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

This section describes impacts to the ACECs designated in the 1996 Big Dry RMP and EIS ROD, the 1999 Areas of Critical Environmental Concern Decision Record and Approved Amendment of the Billings, Powder River, and South Dakota Resource Management Plans, proposed expansions of those ACECs, and proposed new ACECs in the planning area, "Comparative Summary of Areas of Critical Environmental Concern by Alternative", as well as impacts if no ACECs are designated. ACECs are designated to provide special management for relevant and important values, resources, natural systems, and natural hazards, referred to as "values of concern". The discussion of ACECs focuses on the values of concern and potential impacts to those values from other programs. Many of the values of concern in ACECs are also resources with management independent of ACEC designation; this non-ACEC management is addressed under the relevant sections of this chapter. The analysis in this section focuses on relative comparisons among alternatives of potential adverse and beneficial impacts in ACECs.

SUMMARY OF IMPACTS

In an effort to limit adverse impacts to values of concern, specific management prescriptions must be adopted for each ACEC because there are no automatic management prescriptions. Alternative B would have the most beneficial impacts to ACECs because all ACECs under Alternative B would have the most restrictive prescriptions, such as validity examinations would be conducted on mining claims within the ACECs if surface disturbing operations are proposed on the subject mining claims; Mineral material sales and permits would be closed; Oil and gas leasing would be open and surface occupancy and use would be prohibited (NSO); ROWs would be avoided; and areas would be managed according to VRM Class II. On the other hand Alternative D

would be the least restrictive where, for example, areas would be managed according to VRM Class III and IV. Otherwise, one would have to see specific ACECs for specific prescriptions by alternative.

ASSUMPTIONS AND METHODOLOGY

ACECs are areas requiring special management to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards (43 CFR 1610.0–5). Only one management prescription comes automatically with ACEC designation; in an ACEC, a Plan of Operations for locatable mineral exploration and development is required regardless of the amount of surface disturbance, whereas outside an ACEC, mining operations that meet the requirements of 43 CFR3809.11 are allowed to proceed under an approved Plan of Operations. The requirement for a Plan of Operations allows the BLM limited ability to avoid or mitigate potential adverse impacts associated with locatable mining operations such as uranium and gold mines, but does not preclude development. In an effort to limit adverse impacts to values of concern, specific management prescriptions must be adopted for each ACEC because there are no automatic management prescriptions other than a Plan of Operations for small disturbances (generally, exploration).

IMPACTS COMMON TO ALL ALTERNATIVES

Generally, management prescriptions for the protection of air quality, geology, soil, water, and lands with wilderness characteristics would benefit ACECs by preventing the degradation of those resources located within the ACEC. This beneficial impact to ACECs would be secondary to other benefits, such as improving wildlife habitat.

Each proposed ACEC meets the FLPMA relevance and importance criteria (*Special Designation Areas Appendix*). This section analyzes the impacts to relevant ACEC values from management actions for other programs. Impacts to other programs from ACEC designations are addressed in resource-specific sections of this chapter. In addition, this section only analyzes impacts to the values that meet the relevance and importance criteria. Impacts to other values in the ACEC are not analyzed unless they contribute to the need for special management.

All of the proposed ACECs are designed to protect cultural, historic, and/or paleontological resources. In general, surface-disturbing activities such as mineral development and realty actions reduce the quality of the setting by causing fragmentation and removing vegetation. Often these developments also create a moderate to strong contrast with the characteristic landscape for visual resources or historical setting of ACECs. Therefore, surface-disturbing activities, regardless of the cause, generally result in adverse impacts to ACEC values. In the analysis that follows, the adverse impacts of surface disturbance will not be discussed repetitively; additional information regarding adverse impacts to wildlife, historic, and visual resources are found in those respective sections.

Impacts to ACEC values from management actions for cultural and paleontological resources would be generally similar under all alternatives because of NHPA requirements. Cultural and paleontological resource management could result in limited surface disturbance and loss of vegetation if excavation is necessary. These potential impacts are addressed only for ACECs in which such surface disturbance is anticipated to adversely impact visual and historic resources, as impacts to wildlife habitat would likely be minimal.

Because surface-disturbing activities (including locatable mineral entry, geophysical exploration, livestock grazing, fire suppression activities, and forest product and biomass material management) would have the potential to impact ACEC values, they would be evaluated on a case-by-case basis. In almost all circumstances, under all Alternatives, impacts from surface-disturbing activities, where allowed, would be avoided by project redesign or relocation, which would eliminate the need for implementation of mitigation measures. However, should impacts be unavoidable, authorization would be denied, or mitigation would be applied prior to authorization. Although surface-disturbing activities would have the potential to impact ACEC values, few surface-disturbing activities would be permitted within ACECs under all alternative.

Additionally, surface-disturbing activities associated with fire suppression activities and the management of forest products and biomass materials would have the potential to impact ACECs through exposure, disturbance, and destruction of cultural or paleontological values. These actions would be evaluated on a case-by-case basis under all alternatives. In the Finger Buttes and Smoky Butte ACECS, these actions would have the slight potential to impact the values of the ACEC.

Authorizing grazing and range improvements that provided for the improvement or maintenance of ecosystem functionality would vary according to resource type and environmental setting. Impacts from grazing would most often be caused by trampling, trailing, rubbing, and overgrazing. Impacts to cultural and paleontological surface sites and localities and cultural artifacts would include damage to artifacts or fossilized remains and disturbance of the site or locality context and integrity of material association.

Cattle trailing, particularly to and from water sources and along fencelines, would create ruts that exposed sites, localities, and artifacts or fossilized remains, which would result in accelerated erosion that caused damage to and loss of sites, information, and remains. Increased erosion caused by vegetation removal by livestock would result in additional impacts to prehistoric sites and features, cultural or paleontological localities, and fossilized remains. Buried prehistoric sites located along major streambanks would be subject to livestock-caused streambank erosion. Livestock that gathered under or near structures for shade or shelter or livestock that rubbed or leaned on the structures would impact historic sites, such as those with fragile standing buildings and structures related to homesteading, by causing wear or possible collapse of the structure.

Prescribed fire would have the potential to impact ACEC resources through fireline disturbances associated with fire containment. Cultural resource surveys would be conducted to identify cultural values prior to fire ignition, avoidance would be the standard field operating procedure employed to protect ACEC values.

Open OHV use would impact ACEC resources. Impacts would include erosion, soil compaction, and loss of ground cover. In addition, accompanying auditory, olfactory, and visual elements would be introduced and alter some of the traditional use areas. Expanded access to remote areas would increase vandalism of the ACEC resource and general degradation of the historic and natural landscape. However, under all Alternatives, OHV use in all ACECs is restricted to Limited or closed, except for the Smoky Butte ACEC in which OHV use is closed under Alternative A. Limiting OHV use would reduce the number of roads and trails available for use, which would reduce subsequent impacts to cultural and paleontological resources.

Open OHV use would subject ACEC resources to the impacts of OHV use. Limiting OHV use would reduce the number of roads and trails available for use, which would reduce subsequent impacts to cultural and paleontological resources. However, limiting OHV use to existing roads and trails in ACECs would cause impacts to cultural and paleontological resource values from these activities. OHV use is considered a surface-disturbing activity and would have the potential to cause direct and indirect impacts to cultural resources by altering, directly or indirectly, any of the characteristics of a cultural or historic property in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. In addition, these actions would have the potential to cause direct and indirect impacts to cultural or paleontological resources by altering, directly or indirectly, the characteristics of a resource in a manner that diminished the scientific integrity or context of the resource.

OHV use would potentially cause surface disturbance and impacts to cultural properties and paleontological resources through removal, damage, or destruction of cultural and paleontological resources that resulted in the loss of important data. Direct impacts to the archeological record would include artifact crushing and breakage, erosion, soil compaction from the pressure of vehicle wheels, loss of ground cover, and scattering of cultural material as OHVs were driven through and across a site. Soil erosion processes would be intensified by the removal of protective ground cover, such as vegetation and natural clutter, particularly when ruts and trails were formed from repeated crossings. Shallowly buried sites with subsurface cultural material would be particularly vulnerable to disturbance from OHV-caused ruts and trails. In addition, accompanying auditory, olfactory, and visual elements would be introduced and alter some of the traditional use areas. Expanded access to remote areas would increase vandalism of the ACEC resource and general degradation of the historic and natural landscape.

Indirect impacts of OHV use would include the use of OHVs to access, and then loot or destroy archeological sites and paleontological localities. This form of destruction would include artifact collecting and souvenir hunting of archeological material, but would also include hobby collecting of invertebrate remains (although this activity would be allowable in small quantities) and illicit removal of significant vertebrate remains for paleontological materials. Both activities would be considered vandalism, intentional, and illegal.

Quick and easy access to cultural locations would result in increased illicit collection, rutting, and erosion of many of these sites that were previously inaccessible (except by foot or horse). The level of visitation would influence access to certain areas and the incidence of vandalism and illicit collection. OHV use by vandals would allow quick, often-undetected collection of the information or object. Additionally, artifacts and fossil remains too heavy to transport by foot could be transported by OHV and for much longer distances.

In the past, these previously inaccessible areas, which were often sought for their remoteness, solitude, and pristine qualities, have been directly affected by the introduction of motorized sounds, dust, smells, and user-created roads and trails. Greater visitor use to some areas has led to the increase of vandalism, illicit collection, littering, and disturbance to cultural or paleontological sites. Vandalism has increased in previously inaccessible areas, because many visitors now use OHVs, which are capable of reaching these formerly isolated areas.

Expanded access and increased visitation would also potentially impede some traditional cultural uses by tribes. While cultural or paleontological properties situated along designated trails and road corridors would potentially be signed, monitored, patrolled, and protected, the impacts outside of these areas would be largely uncontrolled and the extent of impacts unknown. Prohibiting or limiting motorized wheeled cross-country travel under this alternative would potentially protect sites and localities from vandalism in areas in which OHVs would be used for access. If road and trail restrictions left substantial, contiguous portions of public lands isolated from motorized travel, vandalism should diminish, because accessibility is one of the major factors in the rate of vandalism. Reducing accessibility would restore some areas and landscapes to their former remoteness and protect the natural solitude, isolation, and quiet necessary for the continuation of traditional cultural practices. ACEC designation triggers the requirement of a Plan of Operations for locatable mineral activities even if less than five acres are to be disturbed. The environmental impact of requiring a Plan of Operations is a modest to moderate inconvenience to a mining applicant in the exploratory phase since having the BLM review a Plan of Operations is administratively more burdensome than the applicant's merely filing a Notice. (Full-development mining operations generally exceed five acres of disturbance and require a Plan of Operations.) In addition, in reviewing the Plan of Operations, the BLM could require some modification of the applicant's approach in order to minimize adverse impacts, but would not prevent successful recovery of the mineral resource. The requirement for a Plan of Operations could make the mining operation more costly or more time consuming, which would be adverse impacts to the claimant. However, these are not considered adverse impacts to the locatable mineral resource, since recovery would not be precluded.

Restrictions on the exploration for, or development of mineral resources other than locatable minerals and realty actions would generally result in beneficial impacts to values of concern. The impacts of ACECs on those programs are analyzed in their respective sections.

All of the ACECs have management prescriptions for major ROWs such as large pipelines, transmission lines, and wind-energy developments. Impacts from smaller ROWs are not analyzed because they depend on site-specific factors.

Livestock grazing management varies by alternative but is authorized in all ACECs except several (Big Sheep Mountain, Hoe and Powder River Depot) analyze small grazing exclosures. Similar to other surface disturbances, disturbance associated with range improvement projects would result in adverse impacts to ACEC values because of the loss of vegetation due to livestock grazing concentration and surface disturbance and the increases in habitat fragmentation,. However, range improvements would be allowed so long as they would not have an impact on the values of the ACEC.

OHVs would be limited to designated routes that exist in ACECS. But since many of the existing and proposed ACECs are small, no roads or trails exist, thus no mention is made for their prescription. Depending on the ACE

and alternative some management action close the areas to all travel (alternative B) and some are close to all travel except for authorized administrative and permitted uses.

The analysis of Alternative A addresses potential impacts to identified relevant and important values in the absence of ACEC management. Although Alternative A does not designate ACECs, the area analyzed under Alternative A is called the ACEC to refer to the same geographic area analyzed under alternatives B through E. Similarly, in analyzing proposed new ACECs and proposed expansion of ACECs not designated under Alternative A, the area analyzed is described as the ACEC or expanded area to describe the geographic area, not the management.

For all ACECs under each alternative, acreage is given for federal surface only. Management of federal mineral estate in split-estate ownership will also be governed by ACEC management actions. In no case does ACEC management apply to private or state lands, which are “clipped out” of the ACEC, even if federally owned minerals in those clipped out areas are subject to ACEC management.

Impacts common to all alternatives for each ACEC are described under Impacts Common to All Alternatives.

Under all alternatives, the use of heavy equipment in fire suppression would be restricted in areas containing sensitive resources. This includes all ACECs. Therefore, adverse impacts to ACEC values from the use of heavy equipment would not vary by alternative and are not further analyzed in this section. Whether or not full suppression of wildfire is utilized varies by alternative. Full suppression could result in adverse impacts to wildlife and visual resources, at least in the short-term, if resources were damaged by fire suppression efforts. Conversely, full suppression would result in short-term beneficial impacts by preventing fire damage to vegetation. However, on a long-term basis, full suppression could lead to fuels buildup and increase the risk of landscape-level fires, with substantial adverse impacts to ACEC values.

Although surface-disturbing activities would have the potential to impact ACEC values, few surface-disturbing activities would be permitted within ACECs. In almost all circumstances, impacts from surface-disturbing activities would be avoided by project redesign or relocation, which would eliminate the need for implementation of mitigation measures. However, should impacts be unavoidable, mitigation would be applied prior to authorization of project implementation. Because surface-disturbing activities would have the potential to impact ACEC values, they would be evaluated on a case-by-case basis.

Cultural and Paleontological surface-disturbing activities, such as data recovery, excavation, and removal of cultural or fossil material activities, would be allowed on all ACECs and paleontological locality special management areas with an approved permit. Scientific-sponsored study, excavation, and removal of cultural or fossil material would always result in the loss of some data in the process, particularly if the cultural or paleontological values were significant for their in situ and intact values.

Impacts from adjustments in grazing permitted use AUMs based on resource conditions within allotments that overlapped ACECs would depend on the resources in the ACEC and the existing environmental conditions within the ACEC. Trampling, trailing, and rubbing would potentially impact resources directly, while erosion, vegetation, and landscape modification would potentially impact resources indirectly. Grazing permitted use adjustments would be made on a case-by-case basis. If necessary, modifications would be made or mitigation measures would be applied to reduce the potential for impacts from permitted use adjustment.

Acquiring lands in or near ACECs would benefit ACECs. The disposal of lands in any ACEC through land status updates or corrections would impact ACECs. However, the removal of any lands from federal administration, including those in or near ACECs, would also remove the laws and regulations that fully protected resources in these areas; subsequently, these resources would be subject to the range of impacts and impacts that would not occur under federal policies, laws, and regulations that dictated BLM management decisions.

Any surface-disturbing activity that occurred under the jurisdiction of other entities on withdrawn lands within ACEC boundaries would have the potential to impact ACECs by altering or damaging the resources protected by the ACEC.

The BLM would protect relevant and important resource values with special management and ACEC designations. The agency would apply special management where standard or routine management would be inadequate to protect the resource values from risks and threats of damage or degradation or to protect public safety when faced with natural hazards.

ALTERNATIVE A (No Action)

Summary Statement

Under Alternative A, OHV use in all ACECs is restricted to Limited except for the Smoky Butte ACEC in which OHV use is closed.

Resources and Resource Uses

Partial closures or timing restrictions for livestock grazing in the Piping Plover ACEC would reduce potential for trampling nests. Potential impacts from livestock grazing Black-footed Ferret Reintroduction ACEC would include changes in vegetative composition resulting from changes in the management of livestock grazing.

Impacts of vegetation and fuel treatments in the Piping Plover and Black-footed Ferret Reintroduction ACECs would vary by the habitat needs of species. However, the probability of fuels treatments in either ACEC although allowed, is minimal. Vegetation treatments (e.g., mechanical treatments) that altered vegetative species composition or stand structure for specific resource objectives, including those used to meet Rangeland Health Standards, would alter wildlife habitats immediately. Impacts would depend largely on species, habitat conditions before and after treatments, the type of treatment, details of treatment implementation, adjacent habitat types, and long-term management of each area after treatments.

ALTERNATIVE B

Summary Statement

Partial closures or timing restrictions for livestock grazing in the Piping Plover ACEC would be the same as under Alternative A. Impacts to the Black-footed Ferret Reintroduction ACEC would be the same as addressed in Alternative A.

ALTERNATIVE C

Summary Statement

Because there would be some management actions that allowed surface-disturbing actions in ACECs under Alternative C, these areas and their associated values (cultural, paleontological, wildlife, geologic, or scenic) would potentially be affected. Although a surface use plan of operations would need to be approved by the AO prior to surface disturbance for all surface-disturbing activities within 300 feet of paleontological localities or localities that met the criteria for designation in some ACECs, these activities would potentially impact paleontological values of the ACEC.

Resources and Resource Uses

Geophysical exploration, which would be limited to existing roads and trails under this alternative, would potentially impact the overall values of the proposed ACECs through surface disturbance and disturbance of cultural or paleontological values. Any management action that allowed surface disturbance, including the use of heavy equipment, would have the potential to impact significant cultural or paleontological resources. Surface-disturbing activities would alter the characteristics of a significant cultural or historic property by diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Geophysical activities would potentially create erosion and disturbance that exposed previously unknown and buried paleontological or cultural resource values, which would subject these values to

discovery and loss. Even if individual paleontological values within the ACEC were not affected by geophysical exploration activities, these activities would potentially disturb the settings, terrain, and formations in which undiscovered individual paleontological values potentially occurred. Other impacts to cultural resources from geophysical exploration would include the destruction, damage, or alteration to all or part of the cultural resource or the introduction of visual, atmospheric, or audible elements that would diminish the integrity of the property's significant historic features. In addition, development activities would potentially impact cultural or paleontological values of the ACEC.

Some of the impacts of geophysical exploration would be offset by requiring a mitigation and recovery plan approved by the AO prior to surface disturbance. However, mitigation that would require removal of the cultural or paleontological values would subject them to the data loss inherent to removal, particularly if the values were significant for their intact and in situ values.

Management actions requiring avoidance of ROWs in ACECs would allow these ROWs if there were no acceptable alternative actions; subsequently, these areas would potentially be subject to surface-disturbing actions caused by ROW implementation. Although mitigation would be required in some cases, the values of these ACECs are such that any ROW permitted within the ACEC would greatly reduce and impact the values of the ACEC by diminishing the integrity of the cultural properties' location, settings, materials, feelings, or associations. These actions would impact localities by disturbing the setting of the terrain and the formations in which the individual values may occur.

Under this alternative, paleontological surface-disturbing activities, such as data recovery, excavation, and removal of fossil material activities, would be allowed on the Flat Creek (50 acres) paleontological locality Special Management Area with an approved permit. Scientific-sponsored study, excavation, and removal of fossil material would always result in the loss of some data in the process, particularly if the paleontological values were significant for their in situ and intact values.

A CSU stipulation for oil, and gas leasing and development in the Piping Plover ACEC would mitigate these impacts. Because the USFWS has jurisdiction over federally listed threatened and endangered species, consultation with the USFWS is required if a "may affect" determination is reached and to determine protection and mitigation measures that may be needed.

Partial closures or timing restrictions for livestock grazing in the Piping Plover ACEC would be the same as under Alternative A.

ALTERNATIVE D

Summary Statement

Because there would be some management actions that allowed surface-disturbing actions in ACECs under Alternative D, these areas and their associated values (cultural, paleontological, wildlife, geologic, or scenic) would potentially be affected under this alternative. Although mitigation would be required in some cases, the values of the ACECs are such that any ROW permitted within the proposed ACECs would greatly reduce the values and impact the values of the proposed ACECs by diminishing the integrity of the location, setting, material, feeling, or association of the cultural resource. These actions would impact localities by disturbing the setting of the terrain and the formations in which the individual values may occur.

Resources and Resource Uses

Geophysical exploration, which would be limited within 300 feet of localities under this alternative, would potentially impact the overall values of the proposed ACECs through surface disturbance and disturbance of cultural or paleontological values. Otherwise, any management action that allowed surface disturbance would be the same as under Alternative C.

Surface disturbance associated with oil and gas leasing would have the potential to impact the cultural or paleontological values of the ACEC. Oil and gas leasing would include a multitude of associated development

(e.g., well drilling, well pads, roads, pipelines, power lines, and power plants) with surface-disturbing impacts with the potential to affect ACEC values. Although some of these impacts would be offset by mitigation and recovery, this development would potentially create erosion and disturbance that exposed previously unknown and buried cultural or paleontological resource values, which would subject these values to discovery and loss. Some of the impacts of geophysical exploration or oil and gas leasing and development would be offset by a mitigation and recovery plan approved by the AO prior to surface disturbance. However, mitigation that required removal of the cultural or paleontological values would subject them to the loss of data inherent to removal, particularly if the cultural or paleontological values were significant for their intact and in situ values. Although mitigation by excavation recovers valuable data, the process of archeological excavation, using even the most current archeological methods and technology and employing the best data recovery practices, would result in the destruction of cultural properties or paleontological resources and the destruction and loss of some data. Subsequently, resources would not be available for future study when better analytical techniques may be available.

In the Cedar Creek Battlefield Area, Long Medicine Wheel Area, Walstein Area, Flat Creek Paleontological Area, Powderville Paleontological Area, and Yonkee Area, management actions that allowed development or geophysical exploration would diminish the interpretive value of these areas by diminishing the viewscape. Development adjacent to buffer areas would also impact the viewscape.

Management actions that required buffers or required avoidance of cultural and paleontological values would also diminish the overall values of the ACECs and contradict the creation of the ACECs, which are areas designed to recognize, preserve, and protect resource values from development and intrusive activities.

Under this alternative, paleontological surface-disturbing activities, such as data recovery, excavation, and removal of fossil material activities, would be allowed on the Flat Creek (50 acres) paleontological locality Special Management Area with an approved permit and be the same as under Alternative C.

Potential impacts from livestock grazing in the Piping Plover ACEC would not be restricted seasonally, potentially increasing the potential for trampling nests.

ALTERNATIVE E (Proposed)

Summary Statement

Because there would be some management actions that allowed surface-disturbing actions in ACECs under Alternative E, these areas and their associated values (cultural, paleontological, wildlife, geologic, or scenic) would potentially be affected under this alternative. Although a surface use plan of operations would need to be approved by the AO prior to surface disturbance for all surface-disturbing activities within 300 feet of paleontological localities or localities that met the criteria for designation in some ACECs, these activities would potentially impact paleontological values of the paleontological ACECs (Ash Creek Divide, Bug Creek, Hell Creek, Sand Arroyo, Flat Creek, and Powderville) and ACECs that contained paleontological values (Long Medicine Wheel and Walstein). Some of the impacts of geophysical exploration would be offset by requiring a mitigation and recovery plan approved by the AO prior to surface disturbance. However, mitigation that required the removal of the cultural or paleontological values would subject them to the data loss inherent to removal, particularly if the values were significant for their intact and in situ values.

Resources and Resource Uses

Closing the Battle Butte Battlefield, Reynolds Battlefield, Cedar Creek Battlefield, Long Medicine Wheel, Walstein Area, Yonkee Area, Flat Creek, and Powderville ACECs to mineral material sales and permits would eliminate these surface-disturbing activities.

Geophysical exploration would potentially impact the overall values of the paleontological ACECs (Ash Creek Divide, Bug Creek, Hell Creek, and Sand Arroyo) and the Smoky Butte, Ferret, Flat Creek, Powderville and Walstein ACECs through surface disturbance and disturbance of cultural or paleontological values.

An NSO stipulation for oil and gas leasing and development would prevent surface disturbances associated with these activities, but a CSU stipulation for oil and gas leasing and development would have the potential to impact the wildlife, cultural, and paleontological values in ACECs.

Management actions requiring avoidance of ROWs in ACECs would allow ROWs if there were no acceptable alternative actions; subsequently, these areas would potentially be subject to surface-disturbing actions caused by ROWs. Although mitigation would be required in some cases, the values of these ACECs are such that any ROW permitted within the ACEC would greatly reduce and impact the values of the ACEC by diminishing the integrity of the cultural properties' location, settings, materials, feelings, or associations. These actions would impact localities by disturbing the setting of the terrain and the formations in which the individual values may occur.

BACK COUNTRY BYWAYS

SUMMARY OF IMPACTS

Backcountry Byways will be managed in partnership with all interested groups and agencies to enhance opportunities for the public on public lands. Byways will be developed in accordance with all appropriate laws and regulations while maintaining resource values.

ASSUMPTIONS AND METHODOLOGY

The assumptions regarding the future management of special designations are described below.

- Uses and activities occurring outside special designation allocations could influence byways, although such influences would generally be indirect.
- Management prescribed for back country byways would provide opportunities for motor touring while enhancing the understanding of the multiple uses of public lands. All guidelines for the maintenance of the Byway's characteristics, as identified in this document, would be followed to the extent allowed by existing budget and available personnel.

IMPACTS COMMON TO ALL ALTERNATIVES

Recognized visual values would be potentially diminished (short-term), degraded or lost entirely over the long-term by certain actions and outcomes associated with fire and fuels management. Fires and fuel treatment projects would remove vegetation, which would impact the scenery, naturalness, and ecosystem integrity of an area. Such impacts, however, would not vary substantially by alternative.

Using the visual contrast rating system during project-level planning and compliance with VRM objectives would improve the visual integrity of the current Big Sky Backcountry Byway.

Coal and solids mineral mining, and oil and gas development would potentially diminish and degrade the visual integrity, scenery and naturalness of the current Byway as well as any future byways within the MCFO.

The existing byway's recreation opportunities, benefits, and experiences would be enhanced by the quality recreation opportunities offered by management prioritization.

Opportunities for renewable energy development, if developed, would potentially detract from or impair the scenic, natural, recreational, visual, and cultural opportunities represented in the existing byway.

Any approved ROWs, communication sites, or solar and wind energy projects developed within the existing Big Sky Backcountry Byway would potentially impact the scenic, natural, and recreational opportunities along this byway. Currently, except for the highway itself, the surrounding Eastern Montana landscape is mostly natural with uninterrupted vistas.

Existing ACECs, as well as any new proposals, near the Big Sky Backcountry Byway would benefit naturalness and vistas on both sides of the Byway, which would create an enjoyable motor drive for those on the byway.

Using interpretation to enhance visitor experience along the Byway would benefit travelers along the route by creating opportunities to learn and appreciate the Byway and create exploratory opportunities

ALTERNATIVE A (No Action)

Summary Statement

Under Alternative A, there is currently one byway, the Big Sky Backcountry Byway. Resource uses have the potential to alter the visual integrity and scenery of this byway; however, current ACECs benefit and enhance opportunities along the route.

Resources

Using the visual contrast rating system during project-level planning and compliance with VRM objectives would improve the visual integrity of the current Big Sky Backcountry Byway.

Resource Uses

Opportunities for renewable energy development, if developed, would potentially detract from or impair the scenic, natural, recreational, visual, and cultural opportunities represented in the existing byway.

Authorized uses associated with mineral and energy resource development and realty actions, which would occur in most of the planning area, (including coal, mineral materials and locatable minerals mining, oil and gas development, rights-of-way, renewable energy, and land use leasing) within the existing Big Sky Backcountry Byway would potentially impact the scenic, natural, cultural and recreational opportunities along this byway. Currently, except for the highway itself, the surrounding Eastern Montana landscape is mostly natural with uninterrupted vistas.

Special Designations

Existing and maintaining current ACECs, as well as any new proposals, near the Big Sky Backcountry Byway would benefit naturalness and vistas on both sides of the Byway, which would create an enjoyable motor drive for those on the byway.

ALTERNATIVE B

Summary Statement

Alternative B would enhance protections for naturalness, scenic vistas, and visual integrity along the current Big Sky Backcountry Byway as well as any future byways within the MCFO. Program management under this alternative places restrictions on visual intrusions and developments which would result in complimenting and enhancing the experiences visitors seek when using a byway.

Resources

Using the visual contrast rating system during project-level planning and compliance with VRM objectives would improve the visual integrity of the current Big Sky Backcountry Byway. A Class II VRM management objective in 580,000 acres within the MCFO would be in place, the highest of any alternative, which would limit disturbance near highly seen areas.

Alternative B soil, water, riparian, fish and wildlife management, fire, and cultural resources beneficially impact byways by limiting surface disturbing activities and reducing the probability of visual intrusions near potential backcountry byways.

Resource Uses

By designating the Terry OHV area a SRMA would enhance recreation opportunities along the Big Sky Backcountry Byway, which would enhance the recreational opportunities for those travelling along the Byway route.

Impacts for new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A. However due to the level of resource restrictions on development, the overall impacts are much less those of Alternative A.

Special Designations

Existing and maintaining current ACECs, as well as any new proposals, near the Big Sky Backcountry Byway would benefit naturalness and vistas on both sides of the Byway, which would create an enjoyable motor drive for those on the byway.

ALTERNATIVE C

Summary Statement

Under alternative C, management prescriptions are less protective than Alternative B, thus has fewer beneficial impacts to experiences and benefits that byway users are seeking as they travel a backcountry byway.

Resources

Alternative C would provide for 410,000 acres under VRM Class II management objective, 700,000 acres under VRM Class III, and 1,600,000 acres under VRM Class IV. Additional modifications to the landscape could be completed with these management objectives causing more surface disturbance near a backcountry byway. Using the visual contrast rating system during project-level planning and compliance with VRM objectives would improve the visual integrity of the current Big Sky Backcountry Byway and future byways.

Alternative C air, soil, water and fish and wildlife management is less protective than alternative B and thus has fewer beneficial impacts for backcountry byways.

Resource Uses

Designating the Terry OHV area a SRMA would enhance recreation opportunities along the Big Sky Backcountry Byway, which would enhance the recreational opportunities for those travelling along the Byway route.

Impacts for new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A. However due to the level of resource restrictions on development, the overall impacts are much less those of Alternative A.

Special Designations

Existing and maintaining current ACECs, as well as any new proposals, near the Big Sky Backcountry Byway would benefit naturalness and vistas on both sides of the Byway, which would create an enjoyable motor drive for those on the byway.

ALTERNATIVE D

Summary Statement

The impacts from program management under alternative D are similar to that under Alternative C. Alternative D has less protective measures from visual integrity, naturalness, and scenic vistas than Alternative B.

Resources

Alternative D would provide for 360,000 acres under VRM Class II management objective, 740,000 acres under VRM Class III, and 1,600,000 acres under VRM Class IV. Additional modifications to the landscape could be completed with these management objectives causing more surface disturbance near a backcountry byway. Using the visual contrast rating system during project-level planning and compliance with VRM objectives would improve the visual integrity of the current Big Sky Backcountry Byway and future byways.

Alternative C air, soil, water and fish and wildlife management is less protective than alternative B and thus has fewer beneficial impacts for backcountry byways.

Resource Uses

Designating the Terry OHV area an ERMA would enhance recreation opportunities along the Big Sky Backcountry Byway, which would enhance the recreational opportunities for those travelling along the Byway route.

The impacts and level of new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A.

Special Designations

Existing and maintaining current ACECs, as well as any new proposals, near the Big Sky Backcountry Byway would benefit naturalness and vistas on both sides of the Byway, which would create an enjoyable motor drive for those on the byway.

ALTERNATIVE E (Proposed)

Summary Statement

Management under Alternative E

Resources

Alternative E would provide for 410,000 acres under VRM Class II management objective, 690,000 acres under VRM Class III, and 1,600,000 acres under VRM Class IV. Additional modifications to the landscape could be completed with these management objectives causing more surface disturbance than Alternative B, but less than Alternative A, near a backcountry byway. Using the visual contrast rating system during project-level planning and compliance with VRM objectives would improve the visual integrity of the current Big Sky Backcountry Byway and future byways.

Alternative E management prescriptions for air, water, soil, and fish and wildlife management allow some surface disturbing activities with mitigation measures and standards in place which beneficially impacts byways. This management protects scenic and visual intrusions along byway routes as well as disruptive activities that would interfere with byway users.

Resource Uses

By designating the Terry OHV area as Public Lands Not Designated Recreation Management Areas, would decrease the recreation opportunities for those travelling along the Byway route.

The impacts and level of new authorized uses associated with mineral and energy resource development and realty actions would be similar to those from Alternative A. However, the level of development or surface disturbance in sensitive resource areas would be limited.

Special Designations

Existing and maintaining current ACECs, as well as any new proposals, near the Big Sky Backcountry Byway would benefit naturalness and vistas on both sides of the Byway, which would create an enjoyable motor drive for those on the byway.

CUMULATIVE IMPACTS

Use of the designated Big Sky Back Country Byway route by the public would potentially result in impacts to landowners and residents adjacent to the route, in particular increased traffic in a fairly remote area, which would result in requests for assistance, particularly in times of bad weather.

Byway users are dependent on the natural resource base and the weather for the quality experiences they desire. Climate creates opportunities and limitations for outdoor recreation. Higher temperatures could result in increased opportunities for enjoying the byway for a longer portion of the year (fall and winter) in the planning area. However, decreased opportunities for driving the Byway could also happen during the hottest part of the year from higher heat, forest fires, or reduced air quality caused by climate changes to the natural resource base. The extent of the potential impacts is highly dependent on the type of activity, the climate change that occurs, and how the recreationist adapts to the changes.

NATIONAL TRAILS

SUMMARY OF IMPACTS

Within the planning area, one NHT trail exists and that is the Lewis and Clark NHT. Adverse impacts to NHTs typically result in a loss of integrity of the resource, or in cases a loss of archeological information. Adverse impacts to significant trail resources on BLM administered lands occur for several reasons, including actions that physically damage or destroy all or parts of a NHT; actions that alter a significant element of a trail; actions that introduce visual, atmospheric (air), or audible (noise) elements that can diminish the historical integrity of an NHT; and a lack of action, which, in certain cases can allow a trail resource to deteriorate. Adverse impacts can also occur from increased access to areas with trail resources, resulting in increased use, erosion, looting and vandalism.

The NHT is highly significant for association with an important event in American history. In the planning area, this NHT is also significant for the historical setting, which helps visitors imagine what it was like along the trail when Lewis and Clark made the trek. However, cumulative impacts such as those to private inholdings or other entities make some adverse impacts difficult to ignore.

Congressional designation of a trail as part of the National Trails System signifies that the resource is of exceptional scenic, recreational, and/or historic value.

ASSUMPTIONS AND METHODOLOGY

Methods and assumptions used in this impact analysis include the following:

- NHTs are managed and protected in accordance with the National Trails System Act, Section 106 of the NHPA, the National Landscape Conservation System Act, Executive Order 13195, BLM Manual 6250, *National Scenic and Historic Trail Administration* and BLM Manual 6280, *Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation*
- Activities occurring on private lands will not be affected by any BLM management prescriptions unless those activities involve federal assistance or require a federal license.
- Public demand and use of the Lewis and Clark National Historic Trail will increase as recreation use is expected to increase as well.
- Use of several SRMAs that fall within the Lewis and Clark National Historic Trail SRMA, will also increase with the continued recreation use increases in the planning area and surrounding communities.

- The Lewis and Clark National Historic Trails traverse the planning area following designated motorized routes. Public lands that border the designated routes of this trail compose a very small portion of length within the planning area.
- The BLM would continue to mitigate impacts to designated national historic trails from authorized uses through project abandonment, redesign, or other mitigation, if necessary, in accordance with the BLM national 2012 *Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers regarding the Manner in which BLM will meet its Responsibilities under the National Historic Preservation Act* and the 1998 *State Protocol Agreement between the Montana State Director, Bureau of Land Management and the Montana State Historic Preservation Office regarding the manner in which the BLM will meet its responsibilities under the National Historic Preservation Act as provided for in the National Programmatic Agreement*.
- Measures that withdraw land or restrict surface development to protect resources can provide direct and indirect protection of historic trail and associated cultural resources from disturbance and from incompatible and unauthorized activities.
- Natural processes, such as erosion or weathering, will degrade the integrity of many types of historic trails and cultural resources over time. Human visitation, recreation, OHV use, livestock grazing, fire and non-fire vegetation treatments, and other activities can increase the rate of deterioration through natural processes. While the effect of a few incidents may be negligible, the effect of repeated actions or visits over time could intensify impacts.
- Uses and activities occurring outside national historic trail allocations could influence national historic trails, although such influences would generally be indirect.
- All guidelines for the maintenance of the national historic trail characteristics, as identified in this document would be followed, to the extent allowed by existing budget and available personnel.
- The BLM encourages opportunities to cooperate with private landowners to minimize or eliminate disturbance to NHTs.

IMPACTS COMMON TO ALL ALTERNATIVES

The Lewis and Clark NHT lies within the Lewis and Clark SRMA, therefore the same management prescriptions apply and the impact analysis are the same as those found in the Recreation section of this document.

Soils reclamation management would provide long-term, indirect protection by rehabilitation of surface disturbing activities, thereby preserving the visual integrity of historic trails.

Meeting or exceeding Montana water quality standards would indirectly protect the historic trails from physical impacts in those areas in which they overlap with unstable area hydrologic features. In addition, these management actions would preserve the integrity of the setting where it extends into these resource areas. Water development projects would require standard cultural resource inventory and mitigation measures to minimize impacts on the historic trail.

Vegetation and Fish and Wildlife, management actions would provide a systematic and proactive means to address direct and indirect impacts to the Lewis and Clark National Historic Trail and impacts would be mitigated during the activity and project-level planning process. Mitigation measures would be implemented to reduce visual impacts that would potentially introduce intrusive elements on public lands along the trails and thus protect the visual qualities of BLM-administered lands along the trail.

Disturbance and loss caused by fires would potentially decrease vegetation, which would increase the potential for soil erosion and result in the accelerated deterioration of the river and banks along which the Lewis and Clark National Historic Trail travels.

Management actions associated with cultural resources would provide direct protection to the historic trails through restrictions placed on surface-disturbing and other disruptive activities. Mitigation measures would reduce the potential for significant effects to or near the historic trail.

In all VRM management classes, activities would be mitigated to prevent compromising the objectives of the VRM class. Mitigation measures and using the visual contrast rating system during project level planning would be implemented to reduce visual impacts that would potentially introduce intrusive elements on public lands along the trails and subsequently protect the visual qualities of BLM-administered lands along the trail. Implementing the Standards for Rangeland Health would maintain or improve soil stability and vegetation cover, thereby protecting the physical integrity and setting of the historic trail. Overuse of an area by livestock would potentially accelerate soil erosion, leading to a loss of national historic trail integrity. Proper construction of range improvement projects would help to minimize impacts to the trail. Any potential impacts to the trail would be evaluated prior to the construction of fences, water developments, and other range improvements, and appropriate mitigation measures would be implemented if needed.

Actions under minerals management that would allow development projects within the setting of the historic trail would be mitigated to minimize significant effects. Assessment of potential impacts would be conducted through viewshed analysis, on-site inspection, and photo analysis. Mitigation measures would be undertaken to minimize the visual intrusions that dominated the landscape associated with the historic trail.

Activities associated with minerals and oil and gas actions would have the potential to directly and indirectly impact the historic trail based on the location and amount of disturbance near the trail. Impacts would occur in areas in which the BLM must honor existing valid rights and leases. Use of BMPs would mitigate the impacts but special mitigation measures would potentially be necessary on a case-by-case basis for specific projects.

The Powder River Depot, Matthews Recreation Area, Calypso SRMA, Lewis and Clark National Historic Trail SRMA, and Howrey Island Recreation Area would overlap portions of the Lewis and Clark National Historic Trail. Management of SRMAs and recreation areas would encourage recreation and development of facilities, which could result indirectly through the larger presence of human activity. Facility development would be required to inventory and mitigation measures. However, management of the SRMAs would also provide information and education about historic resources in the area, which would increase community awareness for historic resources and reduce the potential for incidental or purposeful disturbance of cultural resources near the trail.

Impacts from Travel Management and OHV actions would potentially occur near the historic trail when illegal activities take place, which would affect the physical integrity and setting of the trail.

Lands and Realty actions (including renewable energy) that resulted in development or surface disturbance projects within the setting of the national historic trail would be mitigated to minimize significant effects, and mitigation measures would be undertaken to minimize the visual intrusions that would dominate the landscape associated with the trail.

Protections afforded to Special Designation Areas would indirectly protect the historic trail by limiting the potential for impacts to the trail or to the integrity of the associated setting of the trail. NSO stipulations would provide a high level of protection by prohibiting surface-disturbing activities.

ALTERNATIVE A (No Action)

Summary Statement

Alternative A uses and recognizes current management from the *1996 Big Dry Resource Area Management Plan* , which guided protection and management along the Lewis and Clark Special Recreation Management Area (SRMA). Impacts to the NHT from these management actions are neutral in most cases to beneficial in others.

Resources

Impacts from resources are the similar to those found in the Impacts Common to All Alternatives and the Recreation section of this document.

There would be no priority treatment areas for invasive species under Alternative A which could allow an unnatural setting to gain control within the NHT.

Resource Uses

The BLM administered public lands within the NHT would be available for livestock grazing. If livestock grazing was a factor in which Standards for Rangeland Health were not met, grazing permits would be issued to make progress and overuse of an area by livestock would potentially accelerate soil erosion, leading to a loss of national historic trail integrity. Proper construction of range improvement projects would help to minimize impacts to the trail. Any potential impacts to the trail would be evaluated prior to the construction of fences, water developments, and other range improvements, and appropriate mitigation measures would be implemented if needed to minimize adverse impacts often associated with the introduction of infrastructure that leads to loss of vegetation.

Current management for oil and gas development provides some protections to the immediate foreground of the NHT, but does not protect the historic settings of the NHTs outside this area. Oil and gas leasing within the Lewis and Clark SRMA would apply an NSO stipulation only to the BLM administered surface acres, not federal minerals under private or state surface (split estate); 14,000 acres. This NSO stipulation would not provide protection to the NHT from mineral development on non-BLM surface. Potential development could compromise the integrity of the setting and feeling of the historic trail.

Renewable energy actions would be allowed with this alternative. These highly visible ROW projects would seriously impact the trail's value as a historic resource. Alternative A provides no protections from these types of projects beyond standard NHPA measures.

Impacts from resource uses are the similar to those found in the Impacts Common to All Alternatives and the Recreation section of this document.

Special Designations

Protections afforded to Special Designation Areas would indirectly protect the historic trail by limiting the potential for impacts to the trail or to the integrity of the associated setting of the trail. The use of BMPs to minimize disturbance and NSO or CSU stipulations for oil and gas leasing would minimize the disturbance to sensitive resources, which would protect the historic trail by minimizing the amount and size of surface disturbance and decreasing the potential for physical or visual impacts associated with the trail setting.

Under Alternative A, the Lewis and Clark National Trail is part of a Congressionally Designated Trail managed as part of the National Trail Management Corridor, which is a special designation and beneficially impacts the trail.

ALTERNATIVE B

Summary Statement

Alternative B increases proactive management over Alternative A. Management under Alternative B provides more focus and attention to the protection and recreational uses of the NHT.

Resources

Impacts from resources are the similar to those found in the Impacts Common to All Alternatives and the Recreation section of this document.

Priority treatment areas for invasive species would protect the physical integrity of the historic trail setting from disturbances caused by invasive species and assist in protecting the naturalness of the NHT.

Impacts from Cultural Resource actions under this alternative would not be allowed within 0.5 miles providing protection to the historical aspect of the NHT. Designated sites would have protection of the physical integrity and setting to ensure protections from activities that would potentially compromise the values of the trail.

The historic trail would be managed under the Lewis and Clark SRMA VRM management objective as a Class I (1,095 acres) in areas in which it overlaps with WSAs and Class II (13,217 acres) for the remainder of the area. Structures and facilities located within VRM Class II areas on public lands would be required to blend with the surrounding landscape when possible, reducing the number of developments that would degrade the setting of the historic trail when they fall within these areas.

Resource Uses

If Standards for Rangeland Health were not met, and grazing was a factor, allotments would be eliminated and made unavailable for livestock grazing. This would protect the physical integrity and setting of the historic trail by decreasing possible overuse of an area. Proper construction of range improvement projects would help to minimize impacts to the trail. Any potential impacts to the trail would be evaluated prior to the construction of fences, water developments, and other range improvements, and appropriate mitigation measures would be implemented if needed.

NSO stipulations would indirectly protect the historic trail by limiting the potential for impacts to the trail and by limiting the integrity of the associated setting of the trail. Reducing surface disturbance, inundation, and the associated damage to the integrity of the historic trail and its associated setting would protect the national historic trails.

The Powder River Depot, Calypso, and the Lewis and Clark National Historic Trail would be designated SRMAs. Matthews Recreation Area and Howrey Island Recreation Area would become SRMAs and overlap portions of the Lewis and Clark National Historic Trail.

Renewable energy actions and other ROWs occurring on BLM would be not be allowed. Alternative B would result in more beneficial impacts than Alternative A because it limits the percentage of large scale actions that would occur and therefore would prevent ROW intrusions on the NHT.

Impacts from resource uses are the similar to those found in the Impacts Common to All Alternatives and the Recreation section of this document.

Special Designations

Impacts to Special Designation areas within the Lewis and Clark NHT are the same as Alternative A.

ALTERNATIVE C

Summary Statement

Alternative C decreases proactive management as compared to Alternative B. The minimum actions necessary to comply with regulations will be applied to the NHT, which would increase adverse impacts to the NHT.

Resources

Impacts from resources are the similar to those found in the Impacts Common to All Alternatives and the Recreation section of this document.

Using Early Detection Rapid Response for invasive species control would, over the long-term, improve vegetation cover and soil stability protecting the physical integrity, which would enhance the visual integrity of the trail setting.

Impacts from Cultural Resource actions under this alternative would not be allowed within 300 feet of sites providing protection to the historical aspect of the NHT. This is less than Alternative B, resulting in a more adverse impact to the NHT and compromising the historical setting and integrity of the trail.

The historic trail would be managed under the Lewis and Clark SRMA VRM management objective as a Class I (1,095 acres) in areas in which it overlaps with WSAs a Class II (7,954 acres) and a Class III (4,820 acres) for the remainder of area. Structures and facilities located within VRM Class II areas on public lands would be required to blend with the surrounding landscape when possible, reducing the number of developments that would degrade the setting of the historic trail when they occur in these areas. When surface disturbance occurs within a Class III area, changes to the viewshed could be evident, which would potentially decrease the visual setting of the trail. Alternative C classifies less land as VRM Classes II and III than Alternative A and B, which would provide less protection for NHTs from visual modern intrusions.

Resource Uses

Impacts from resource uses are the similar to those found in the Impacts Common to All Alternatives, Alternative A and the Recreation section of this document.

Oil and gas leasing within the Lewis and Clark NHT would apply an NSO stipulation to all federally owned minerals within the NHT corridor; 23,484 acres. This NSO stipulation would provide protection to the NHT from federal mineral development on BLM and split estate surface. No surface occupancy eliminates the potential for oil and gas development to compromise the integrity of the setting and feeling of the historic trail by a federal approval. This stipulation may push development onto lands that do not require a federal approval for development.

Renewable energy actions would be avoided with this alternative. These highly visible ROW projects would seriously impact the trail's value as a historic resource; however when avoided the projects would require mitigation minimizing resource impacts.

Special Designations

Impacts to Special Designation areas within the Lewis and Clark NHT are the same as Alternative A.

ALTERNATIVE D

Summary Statement

Alternative D decreases proactive management as compared to Alternative B and C, but provides management actions necessary to comply with regulations, which would increase adverse impacts to the NHT.

Resources

Impacts from resources are the similar to those found in the Impacts Common to All Alternatives and the Recreation section of this document.

Allowing priority treatment areas for invasive species and surface-disturbing activities such as mechanical treatment to occur for invasive species control would, over the long-term, improve vegetation cover and soil stability protecting the physical integrity, which would enhance the visual integrity of the trail setting. However, if these priority areas were determined specifically by private landowners, and those landowners were not engaged, this would have an adverse impact on NHT public lands.

Management actions associated with cultural resources would provide direct protection to the historic trails through restrictions placed on surface-disturbing and other disruptive activities. Mitigation measures would reduce the potential for significant effects to or near the historic trail. This Alternative is less than Alternative B or C which would have an adverse impact on the NHT.

Impacts to VRM are the same as Alternative C.

Resource Uses

Impacts from resource uses are the similar to those found in the Impacts Common to All Alternatives, Alternative A and the Recreation section of this document.

The Powder River Depot, Calypso, and the Lewis and Clark National Historic Trail (existing SRMA's) would be designated ERMAs. Matthews Recreation Area and Howrey Island Recreation Area would become ERMAs and overlap portions of the Lewis and Clark National Historic Trail. Management of ERMAs and recreation areas would encourage recreation, which could result indirectly through the larger presence of human activity. However, management of the ERMAs would also provide information and education about historic resources in the area, which would increase community awareness for historic resources and reduce the potential for incidental or purposeful disturbance of cultural resources near the trail.

Oil and gas leasing within the Lewis and Clark NHT would apply a CSU stipulation to all federally owned minerals within the NHT corridor; 23,484 acres. This CSU stipulation would provide protection to the NHT from federal mineral development on BLM and split estate surface. Controlled surface use lessens the potential for oil and gas development to compromise the integrity of the setting and feeling of the historic trail; by requiring special design features including location, painting, and camouflage, to blend with the natural surroundings and meet the NHT objectives. This stipulation may push development onto lands that do not require a federal approval for development.

Renewable energy actions would be allowed with this alternative, impacts are the same as Alternative A.

Special Designations

Impacts to Special Designation areas within the Lewis and Clark NHT are the same as Alternative A.

ALTERNATIVE E (Proposed)

Summary Statement

Alternative E establishes that the Lewis and Clark NHT would be managed under the same management actions as the Lewis and Clark SRMA. This alternative also delineates the Lewis and Clark National Trail Management Corridor. Alternative E contains proactive management to meet the SRMA objectives listed in the *Recreation Appendix.* Alternative is provides better protections to the historical settings of the trail than Alternatives A or D, and some of the same protections as Alternative C with mitigation measures in place. Alternative E is less restrictive than Alternative B, yet still protects the historical settings of the trail and associated sites.

Resources

Impacts from resources are the similar to those found in the Impacts Common to All Alternatives and the Recreation section of this document.

Impacts for invasive species control are the same as Alternative C.

Management actions associated with cultural resources would provide direct protection to the historic trails through restrictions placed on surface-disturbing and other disruptive activities. Mitigation measures would reduce the potential for significant effects to or near the historic trail. This Alternative is less than Alternative B or C which would have an adverse impact on the NHT.

The historic trail would be managed under the Lewis and Clark SRMA VRM management objective as a Class II (14,499 acres). Structures and facilities located within VRM Class II areas on public lands would be required to blend with the surrounding landscape when possible, reducing the number of developments that would degrade the setting of the historic trail when they occur in these areas. Alternative E classifies more acres as

VRM Class II than Alternatives C or D and only less than Alternative A due to a GIS acreage change. Alternative E is comparable to Alternative B which would protect the NHT from the introduction of modern visual intrusions.

Resource Uses

Impacts from resource uses are the similar to those found in the Impacts Common to All Alternatives, Alternative A and the Recreation section of this document.

The Calypso and Lewis and Clark (NHT) would remain SRMAs. Matthews Recreation Area and Howrey Island Recreation Area would become SRMAs and overlap portions of the Lewis and Clark National Historic Trail. Management of SRMAs and recreation areas would place additional restrictions on surface-disturbing activities, which would indirectly protect the historic trail, by limiting the potential for impacts to the trail's surroundings and to the integrity of the associated setting. Minimizing surface disturbance would decrease the potential for physical or visual impacts within the trail area.

Impacts from Oil and Gas leasing and development are the same as those in Alternative C.

Renewable energy actions would be allowed with this alternative, impacts are the same as Alternative C.

Special Designations

Impacts to Special Designation areas within the Lewis and Clark NHT are the same as Alternative A.

CUMULATIVE IMPACTS

In general, resource management decisions or actions on state, private, and other federal lands have the potential to affect designated national historic trails in the planning area, particularly since segments of national historic trails in the planning area are designated primarily across private lands and potential cumulative impacts are difficult to estimate.

Users of the Lewis and Clark National Historic Trail, which follows the Yellowstone and Missouri rivers in the MCFO, are dependent on the natural resource base and the weather for quality experiences sought by the recreationist.

Climate creates opportunities and limitations for outdoor recreation. Higher temperatures could result in increased opportunities for warm season activities for a longer portion of the year (fall and winter) for river- and trail-related recreation in the planning area. However, a decrease in the quantity of water and quality of the resource would reduce the opportunity for these same activities. Decreased opportunities for warm season activities could also happen during the hottest part of the year from higher heat, low water levels, or reduced air quality caused by climate changes to the natural resource base. If flooding occurred river recreation opportunities could be decreased and water level decreases could change the use occurring on the trail. The extent of the potential impacts is highly dependent on the type of activity, the climate change that occurs, and how the recreationist adapts to the changes.

WILDERNESS

WILDERNESS STUDY AREAS

SUMMARY OF IMPACTS

All alternatives meet the statutory requirements to ensure the protection of designated WSAs so as not to preclude the ability of Congress to designate these areas as Wilderness Areas.

ASSUMPTIONS AND METHODOLOGY

This analysis considers impacts to wilderness characteristics of naturalness, opportunities for solitude, primitive/unconfined recreation, and special features. Impacts are limited to potential changes in wilderness characteristics for the WSAs. Impacts to WSAs are considered adverse if management actions "impair the suitability of WSAs for preservation as wilderness."

Methods and assumptions used in this impact analysis include the following:

- Management of WSAs will follow BLM Manual 6330, *Management of Wilderness Study Areas*, which allows for little flexibility in management decisions.
- Impacts outside WSAs will not affect wilderness characteristics but are not analyzed as impacts to recreation.
- Increased efforts to reduce motorized and mechanized travel will benefit wilderness visitors and the physical attributes of wilderness areas.
- Resource management would not impact wilderness characteristics in a way that would preclude the ability of Congress to designate the area as wilderness.

IMPACTS COMMON TO ALL ALTERNATIVES

Impacts to wilderness resources would cause minimal variation among the alternatives. The manual section prohibits surface-disturbing activities (and most disruptive activities) and sets management guidelines to preserve wilderness characteristics. Continuing to manage the seven existing WSAs would protect the wilderness characteristics related to naturalness, and prevent impacts to the opportunity for solitude and primitive/unconfined recreation from most program activities.

Managing wildfire in WSAs by prioritizing according to potential risks to life and property would result in short-term adverse impacts to the naturalness and opportunity for primitive/unconfined recreation. However, in the long-term such actions would result in protections to wilderness values.

WSAs are managed as VRM Class I areas in accordance with BLM policy described in IM No. 2000-096 (BLM 2000a). The management objective for VRM Class I areas is to preserve the existing character of the landscape. Visual impairments outside and adjacent to WSAs would be allowed if they were in conformance with the appropriate VRM classification of the adjoining area. Although these impairments would be visible to a visitor inside the WSA, they would not be considered an impact that impaired wilderness suitability within the WSA.

Acquired lands within the Terry Badlands WSA have wilderness characteristics and would be managed for its wilderness values. These lands would be managed in accordance with BLM Manual 6330, *Management of Wilderness Study Areas*. These acquired lands would expect the same level of impacts as the surrounding lands.

BLM-administered oil and gas mineral acres in the Wilderness Study Areas (nondiscretionary closures) would be unavailable for leasing, thus no direct impacts from oil and gas development.

The WSAs are considered *Category 1* retention lands (83,000 acres) and will not be transferred from BLM management by any method during the life of the plan. These lands would not be impacted through a disposal action of any type.

ALTERNATIVE A (No Action)

Summary Statement

The Miles City Field Office has five Wilderness Study Areas for approximately 83,000 acres. Impacts from resources are required to follow BLM Manual 6330, *Management of Wilderness Study Areas;* therefore, most

actions would not impact wilderness characteristics in a way that would preclude the ability of Congress to designate the area as wilderness.

Resources

In accordance with BLM Manual 6330, *Management of Wilderness Study Areas*, vegetation management actions and management actions that prioritized invasive species treatment areas would limit weed treatments in WSAs only to hand or aerial application. Without prioritized areas and adequate treatments, weeds would continue to expand into the WSAs, which would degrade wilderness qualities.

Resource Uses

See *Impacts Common to All Alternatives*.

In the allotments in which the Standards for Rangeland Health were not met and livestock grazing was a causal factor and site-specific analyses demonstrated that Standards for Rangeland Health could be achieved, grazing permits would be issued with specific grazing seasons and livestock numbers and other terms and conditions designed to make progress toward meeting the Standards for Rangeland Health.

Requests for special recreation permits for hunting outfitters and guides would be considered on a case-by-case basis throughout the planning area, subject to environmental, social, and public health and safety concerns. This alternative allows competition of the general recreationist who hunts public land with a commercial hunt. The competition could decrease the general recreationist overall success or satisfaction of their experience. This alternative would not have an effect on preserving the wilderness characteristics of the WSAs.

Special Designations

See *Impacts Common to All Alternatives*.

ALTERNATIVE B

Summary Statement

See Alternative A Summary Statement.

Resources

Management actions designating priority treatment areas for invasive species under this alternative would improve wilderness characteristics in WSAs through the improvement of wildlife and fish habitat, vegetation condition, and water quality.

By not allowing the use of prescribed fire on approximately 2,500,000 acres in the planning area would not allow fire to play its natural ecological role and maintain or improve vegetation resources in WSAs, which would maintain wilderness qualities (e.g., habitat productivity, species diversity, or disease or pest resistance) in the long-term. There would be no adverse impacts in the short-term to naturalness and primitive/unconfined recreation.

Resource Uses

Eliminating and making livestock grazing unavailable where the Standards for Rangeland Health are not met, including areas that extend into WSAs, would impact the natural qualities and solitude of the WSAs by decreasing impacts from grazing permittees. This action would allow the re-vegetation of previously inventoried two-track vehicle routes, decrease the establishment or spread of invasive species, and enhance the wilderness characteristic of the WSAs by allowing the return of natural vegetation. This would also allow

wilderness characteristics to return to their natural state. This action would prevent degradation of the natural qualities of the WSAs.

SRPs for outfitters and guides would not be allowed in the WSAs. This would be beneficial to the general recreationist who hunts public land without competition from a commercial hunt; but would be an adverse economic impact to the hunting outfitter. Overall the loss of 83,000 acres to commercial hunting is approximately 4% of the Field Office. This alternative would not have an effect on preserving the wilderness characteristics of the WSAs.

Special Designations

See *Impacts Common to All Alternatives*.

ALTERNATIVE C

Summary Statement

See Alternative A Summary Statement.

Resources

Management actions that use Early Detection Rapid Response priority treatment areas in designated publicly accessible areas as priority treatment areas for invasive species would result in treatments in WSAs. This action would reduce the risks of invasive species spread in WSAs and outside of adjacent boundaries and improve wilderness characteristics.

The use of prescribed fire to meet multiple objectives would allow wildfire to play its natural ecological role and maintain or improve vegetation resources in WSAs, which would maintain wilderness qualities (e.g., habitat productivity, species diversity, or disease or pest resistance). Prescribed fire projects to restore vegetation community health would maintain wilderness qualities.

Resource Uses

Allotments within WSAs in which the Land Health standards were not met, livestock grazing was a causal factor in the failure to meet these standards, and there was no progress towards meeting the Standards in the allotments within 5 years of making management changes, use would be suspended and not re-authorized until Land Health Standards were attained. Once standards are met, use would be re-authorized at levels to maintain resource objectives. Allotments would be unavailable for grazing if standards could not be met by any level of authorized use. This action would allow the re-vegetation and stabilization of heavily grazed areas, lessen the establishment or spread of invasive species, and enhance the wilderness characteristic of the WSAs. This action would prevent degradation of the natural qualities of the WSAs.

See Alternative A for impacts from outfitter and guiding SRPs in WSAs.

Special Designations

See *Impacts Common to All Alternatives*.

ALTERNATIVE D

Summary Statement

See Alternative A Summary Statement.

Resources

Designation of priority invasive species treatment areas under this alternative would result in weed treatments in the WSAs, which would help maintain wilderness qualities. However, managing weed treatments based on actions on adjacent private land would allow large patches of weeds to remain untreated within the WSAs and potentially degrade wilderness qualities.
See Alternative C for impacts from prescribed fire.

Resource Uses

See Alternative C for impacts from livestock grazing regarding the Standards for Rangeland Health.

See Alternative A for impacts from outfitter and guiding SRPs in WSAs.

Special Designations

See *Impacts Common to All Alternatives*.

ALTERNATIVE E (Proposed)

Summary Statement

See Alternative A Summary Statement.

Resources

See Alternative C for impacts from invasive species and prescribed fire.

Resource Uses

See Alternative C for impacts from livestock grazing regarding the Standards for Rangeland Health.

See Alternative B for impacts from outfitter and guiding SRPs in WSAs.

Special Designations

See *Impacts Common to All Alternatives*.

CUMULATIVE IMPACTS

Section 603 of FLPMA required the Secretary of the Interior to review all areas of the public lands, determine which contain wilderness characteristics, and report the findings to the President by October of 1991. Recommendations were developed as a result of a 15-year wilderness study process by the BLM. Minimum standards for the evaluation were set by Congress in Section 2(c) of the Wilderness Act of 1964. The wilderness studies considered each area's resource values, present and projected future uses of the areas, public input, results of mineral surveys, manageability of the areas as wilderness, and the environmental consequences of designating or not designating the areas as wilderness. In addition, each WSA was further evaluated to compare the area's overall wilderness qualities with their multiple use value for other purposes, such as mining or grazing. Prior to FLPMA, these areas were used for grazing, minimal off-road use, and dispersed recreational use. Wildfires occurred on a more natural basis; invasive species were not an imminent threat; reservoirs were present; and ranches, cropland, and county roads existed nearby. Pre-FLPMA oil and gas leases do occur within the WSAs.

Alternative A (No Action)

WSAs are managed under BLM Manual 6330, *Management of Wilderness Study Areas*. CBNG activity and development next to the Buffalo Creek WSA would impact the wilderness character and viewsheds of the WSAs. Even if development occurred within Class IV VRM areas, wind farm development would impact WSA viewsheds if the developments were visible from inside WSAs and dominant enough to dissuade future visitors. Other activities on federal, state, or private lands would be unlikely to impact WSAs.

Fuels management would improve vegetative resources in WSAs. Continued use of roads not administered under the original WSA inventory would impact the natural qualities of the WSAs by contributing to proliferation of unauthorized routes that impaired wilderness suitability.

Alternative B

Oil and gas development of nearby nonfederal lands not subject to federal regulations would cause impacts under this alternative. Most activities, other than oil and gas, CBNG, or wind power, would have a negligible impact on WSAs under this alternative. BLM restrictions on surface disturbance, VRM mitigation, preferred routes for ROWs, and oil and gas leasing and development would likely reduce impacts; however, activities on state and private lands that might not be subject to restrictions would potentially compromise viewsheds, air quality, opportunities for solitude, and the primitive qualities of the area. Impacts from activities occurring on these lands would depend on the location and the level of activity.

Alternative C

With the exception of oil and gas and wind energy, most activities would have a negligible impact on WSAs under Alternative C. Cumulative impacts would include degradation of visual resources, soils, watershed resources, and vegetation caused by development activities outside WSAs. BLM restrictions on surface disturbance, VRM mitigation, preferred routes for ROWs, and CSU stipulations for oil and gas leasing and development would likely reduce impacts; however, activities on state and private lands that might not be subject to restrictions would potentially compromise viewsheds, air quality, opportunities for solitude, and the primitive qualities of the area. Impacts from activities occurring on these lands would depend on the location and the level of activity.

Alternative D

Oil and gas development adjacent to WSAs would impact the wilderness character and viewsheds of WSAs under Alternative D. Visitor views in WSAs would potentially be affected by development on nearby nonfederal lands not subject to federal regulations that required mitigation of landscape-altering activities. Potential wind farms in close proximity to WSAs would impact the viewsheds and view of the casual observer.

Alternative E (Proposed)

Some activities would have a negligible impact on WSAs under Alternative E. Cumulative impacts would include degradation of visual resources, soils, watershed resources, and vegetation caused by development activities directly outside of WSAs. BLM restrictions on surface disturbance, VRM mitigation, proposed routes for ROWs, NSO and CSU stipulations for oil and gas leasing and development would likely reduce possible impacts; however, activities on state and private lands that might not be subject to restrictions would potentially compromise viewsheds, air quality, opportunities for solitude, and the primitive qualities of the area. Impacts from these lands would depend on the location of the land and the level of activity. Oil and gas development adjacent to WSAs would impact the wilderness character and viewsheds of WSAs under Alternative E. Visitor views in WSAs would potentially be affected by development on nearby nonfederal lands not subject to federal regulations that required mitigation of landscape-altering activities. Potential wind farms in close proximity to WSAs would impact the viewsheds and view of the casual observer.

SOCIAL AND ECONOMIC

SOCIAL CONDITIONS

ASSUMPTIONS AND METHODOLOGY

For the social effects analysis, information from scoping and other planning documents and discussions with people knowledgeable about the study area was used to develop a list of potentially affected groups and individuals, the concerns of these groups, and potential effects to these groups.
Social impacts associated with BLM management actions tend to fall within two general interacting types:

- Social impacts driven by economic impact. These impacts may occur when BLM management actions affect increases or decreases in employment, such as with oil and gas development, which then, in turn, lead to population changes and community infrastructure needs.
- Social impacts that are more based on more intangible qualities such as values and beliefs. This can include how an individual defines his or her quality of life, a person's sense of place of an area, the traditional and cultural land and resource uses, and community identity.

In most cases, the social effects are described in terms of effects to quality of life, which can be caused by changes in resource availability and use. These effects could include changes in the amount and quality of available resources, such as recreation opportunities or oil and gas resource development opportunities, and the resolution or creation of problems related to these activities. Other beliefs that could impact quality of life would include an individual's preservation of a sense of control over decisions that affected their future and a feeling that the government strived to act in ways that considered all stakeholders' needs. Social impacts associated with economic impacts can also affect a person's quality of life. For instance, a person may desire living in a community with numerous employment opportunities, high quality schools and a sense of community cohesion. Others may desire economic diversity or myriad of recreational opportunities.

A key aspect of the social effects analysis approach is to address impacts based on the varying points of view of key type of stakeholders. These categories reflect different linkages people have to public lands. The point of categorization is to allow differentiation of social impacts based on broad differences in view. The social section of Chapter 3 discussed several groupings of stakeholders. It should be noted that these groupings generalize individuals' actual beliefs and values. For instance, some ranchers engage in recreation and are particularly concerned about resource protection. Recreationists may engage in both motorized and non-motorized activities. Some individuals are concerned with resource development and resource protection. There is a lot of subjectivity in how a person will be affected by BLM management actions. The discussion below on how different alternatives may affect these stakeholder groupings is necessarily broad and generalized given the complexity involved when understanding views and values and the uncertainty in knowing what will actually occur in the future.

COMMON TO ALL ALTERNATIVES

The average age of the national and local populations would continue to increase. The *Economic*, *Cultural Resources*, *Livestock Grazing*, *Recreation*, *Transportation*, and *VRM* assumptions and effects sections include information that may be of interest to those readers interested in Social effects.

The BLM, as a governmental agency, would maintain a special government to government relationship with the federally recognized American Indian Tribes whose members exercise their hunting, fishing, and gathering rights on federal lands outside the boundaries of their reservation, including BLM-administered lands within the planning area. These pursuits include fishing for resident game fish species, hunting large and small game, and gathering natural resources for subsistence and medicinal purposes. It is expected that over the life of the plan, the demand from American Indians to exercise their treaty rights on public lands will continue and potentially increase.

Individuals with disabilities could request a permit to travel off designated routes to retrieve game consistent with the Rehabilitation Act of 1973 (29 U.S.C. 720 et seq.). Such access would be addressed on a case-by-case basis by the appropriate manager in consideration of land use plans and habitat concerns. Individuals with disabilities would have off-route opportunities that are not granted to the general public, which would potentially maintain or enhance their quality of life.

Access would be pursued if occasions to enhance opportunities for recreation became available, which would potentially enhance the quality of life for some recreationists.

VRM actions would maintain the overall integrity of the scenic qualities while allowing for development for existing and future uses, which would potentially enhance the quality of life for recreationists and local populations.

Travel plans for high priority areas would address problems and impacts of resource use, which would enhance the quality of life for OHV users and non-OHV users.

Permittees or lessees would be allowed to drive off-road or on closed roads to administer their lease or permit, which would potentially be perceived as unfair to recreationists who are not allowed to drive off-road or on closed roads.

Under any alternative, extreme fire behavior would potentially result in smoke causing eye, throat or lung irritation, injury, loss of property or reduced recreation potential. Any of these effects would potentially cause a temporary decline in the quality of life for affected populations.

The pace and scale of oil and gas development can often concern local communities. Rapid development can drive 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. Rapid population growth for unprepared communities can cause stress on community resources such as educational infrastructure, roads and utilities, emergency services, and community cohesion. Should oil and gas leasing and subsequent development occur, impacts to people living near or using the area in the vicinity of the lease would potentially occur. Oil and gas exploration, drilling, or production, would potentially inconvenience these people through increased traffic and traffic delays, noise, and visual impacts. These impacts would be particularly noticeable in rural areas in which oil and gas development has not occurred previously. The level of inconvenience would depend on the activity affected, traffic patterns within the area, noise levels, the length of time and season in which these activities occurred, and other factors. Creation of new access roads would potentially allow increased public access and exposure of private property to vandalism. For leases in which the surface is privately owned and the mineral estate is federally owned, surface owner agreements, standard lease stipulations, and BMPs would potentially address many of the concerns of private surface owners.

Recent research from the Bakken area (Bohnenkamp et. al. 2011) highlights that the familiarity of residents with other residents and the safety often felt in small rural communities (components of social cohesion) has shifted to in-migration of new people and safety concerns resulting from not knowing these people. There has also been an increasing division being seen between the “haves” and the “have-nots” including between long-time residents and a general increase in the cost of living. Moreover, housing availability is very limited and this causes housing prices to be high compared to similar rural areas in North Dakota and Montana outside the influence of the Bakken oil boom. Many people live in man camps (similar to college dormitories), commute relatively long distances to work, or live in what otherwise may be considered substandard housing. The study also highlights concerns over housing prices and values increasing and the changing of the population. While there is an in-migration of people for oil field jobs, there has also been an out-migration of long-time residents due to not being able to afford the rising housing costs (Bohnenkamp et. al. 2011). In other words, changes occurring on the landscape can affect an individual’s quality of life as well as the traditional uses and culture of an area. How a particular individual or community will be affected by energy development changes is dependent, in part, on what a person or community prioritizes and whether the changes that occur are compatible with their priorities and values. For example, a rural agricultural community may value the energy development because of increased employment and economic diversity, but also see the community’s cultural identity of being an “ag town” disappearing.

The development of large wind farm projects can result in short-term increased employment associated with construction which can produce similar stresses as discussed with oil and gas development on community resources and social cohesion.

Under all of the alternatives, BLM-administered lands in the planning area would potentially be used in land exchanges to acquire lands in other parts of the Montana or Dakotas, outside of the historical culture areas of American Indian Tribes. The net effect of such land tenure adjustments could be to limit or reduce the areas within which tribal treaty rights could be exercised.
No alternative would affect the major social trends or social organization in the local communities of the planning area.

ALTERNATIVE A (No Action)

The forage available for livestock grazing would remain the same as is currently available. The absence of temporal grazing restrictions would allow greater flexibility for managing range allotments by the leaseholders. Under this alternative, there would be no RCAs to allow for flexibility. However, many permittees do not favor these allotments. This alternative would maintain or enhance the quality of life for livestock permittees.

Groups and individuals who give a high priority to resource use would support this alternative because management actions would allow livestock grazing, coal exploration, and oil and gas development to continue as in the past. Overall, employment and income related to BLM activities would increase by approximately 45 percent from current levels, which would potentially lead to population increases (depending on the proportion of local hires, housing availability, and other factors). However, the 45-percent increase in BLM-related employment would equal only about 1.3 percent of total employment in the planning area. BLM program revenues and payments to counties would increase by about 5 percent under this alternative and would be most important to the smaller counties and communities. Those who give a high priority to resource use include many local residents concerned about economic development and its potentially positive effects on the social environment and quality of life of small communities.

Because the long-term decline in wildlife habitat would continue under this alternative, groups and individuals who give a high priority to resource protection would feel that the prairie ecosystem, including greater sage-grouse habitat, and other related resources would not be given enough protection. This would potentially result in a decline in the quality of life for these groups and individuals. American Indians who indicated concern for resources on public lands may also feel these resources would not be protected enough under this alternative.

Recreation management would continue as it has in the past. OHV enthusiasts would continue to use the Glendive and Terry OHV areas. Opportunities to retrieve game off road would not be allowed under this alternative, which would limit hunting opportunities as the population aged. This alternative would not meet the needs of some groups and individuals that indicated that motorized travel should be limited to provide more primate, quiet recreation experiences. Effects from surface disturbance under this alternative would have the greatest impact to recreational settings. Conflict between outfitters and hunters would continue under this alternative.

Under this alternative, OHV activities could continue to cause noise, visual intrusions, and smells that made it difficult for American Indians to engage in their traditional religious practices. Mining, oil and gas development, and other activities would potentially occur in the vicinity of cultural and sacred site areas used for traditional practices. The visual and auditory disruptions from all these activities would potentially interfere with the ability of American Indians to practice their traditional religious activities in an unencumbered way, which would potentially negatively affect the quality of life of those who engaged in these practices.

ALTERNATIVE B

Under this alternative, approximately 44,000 AUMs of livestock grazing would be lost, which could cause problems for ranchers dependent on the lands removed from grazing. In addition, increased costs for range improvements would be incurred. RCAs would be designated to allow for greater flexibility for some permittees; however, many permittees do not favor these allotments. Overall this alternative would result in a decline in income and quality of life for affected livestock permittees.

Groups and individuals who give a high priority to resource use would not support this alternative because it would limit livestock grazing, coal exploration, oil and gas development, wood product sales, and other activities. Overall, employment and income related to BLM activities would increase by approximately 2 percent from current levels. BLM program revenues and payments to counties would decline by about 2 percent compared to current levels, and impacts would be most important to the smaller counties and communities. Those who give a high priority to resource use include many local residents concerned about economic development and the potentially negative effects to the social environment and quality of life of small communities if economic activities stagnated or declined.

Under this alternative, resources such as prairie ecosystems, including greater sage-grouse habitat, would see long-term improvement. Groups and individuals who give a high priority to resource protection would feel that wildlife habitat and other related resources would be given enough protection, which would increase the quality of life for these groups and individuals. American Indians who indicated concern for resources on public lands would also feel that this alternative met their needs

OHV use enthusiasts would continue to use the Glendive and Terry OHV areas but much more of the land would be closed to off-highway use under this alternative. Opportunities to retrieve game off road would not be allowed under this alternative, which would become a problem as the population of the planning area aged. This alternative would meet the needs of groups and individuals who indicate that motorized travel should be limited. Conflict between outfitters and hunters would diminish under this alternative and opportunities for outfitting and guiding would also be greatly reduced.

Under this alternative, OHV activities, mining, and oil and gas activities would decline, which would reduce the likelihood that the visual and auditory disruptions of these activities would occur in the vicinity of cultural and sacred site areas used for traditional practices. These impacts would also reduce the likelihood that these activities would interfere with the ability of American Indians to practice their traditional religious activities in an unencumbered way, which would potentially improve the quality of life of those who engaged in these practices. However, decreased accessibility could potentially make it more difficult for aging American Indians to access areas for traditional practices.

ALTERNATIVE C

Under this alternative, 1,300 AUMs would be eliminated, which is a very small proportion of the AUMs currently authorized (less than 1 percent). Limiting the use of RCAs to lessees residing in the county in which the RCA is located, may make these allotments more acceptable to permittees who operating adjacent to them. This alternative would be effective for invasive species control because the BLM would be able to respond to changing conditions. This alternative would maintain or enhance the quality of life for affected livestock permittees.

Groups and individuals who give a high priority to resource use would support this alternative because management actions would allow livestock grazing, coal exploration, oil and gas development, OHV use, and wood product sales. Overall, employment and income related to BLM activities would increase by approximately 34 percent, which would potentially lead to population increases (depending on the proportion of local hires, housing availability, and other factors). However, the increase in BLM-related employment would equal less than 1 percent of total employment in the planning area. BLM program revenues and payments to counties would increase by about 4 percent under this alternative, and impacts would be most important to the smaller counties and communities. Those who give a high priority to resource use include

many local residents concerned about economic development and its potentially positive effects to the social environment and quality of life of small communities.

Groups and individuals who give a high priority to protection of resources such as prairie ecosystems, including greater sage-grouse habitat, may feel that these resources would be adequately protected, which would potentially enhance their quality of life. American Indians who indicated concern for resources on public lands may also feel that this alternative meets their needs.

Under this alternative, OHV enthusiasts would be allowed to continue to use the Glendive and Terry OHV areas but parts of these areas would be closed to OHV use. Although opportunities to retrieve game off road would be allowed for people with a permit to hunt from their vehicle, this activity would not be expected to occur often.
This alternative would meet the needs of groups and individuals who feel that motorized travel should be limited. Although conflict between outfitters and hunters would diminish under this alternative, opportunities for outfitting and guiding would also be reduced.

Under this alternative, OHV activities would be limited; subsequently, the visual and auditory disruptions of these activities would be less likely to occur in the vicinity of cultural and sacred site areas used for traditional practices. These impacts would also reduce the likelihood that these activities would interfere with the ability of American Indians to practice their traditional religious activities in an unencumbered way, which would potentially improve the quality of life of those who engaged in these practices. However, decreased accessibility would potentially make it more difficult for aging American Indians to access areas for traditional practices.

ALTERNATIVE D

Under this alternative, approximately 500 AUMs would be eliminated, which is a very small proportion of the AUMs currently authorized (less than 1 percent). Although there would be no RCAs to allow for flexibility, many permittees do not favor these allotments for a variety of reasons. Overall, this alternative would maintain or enhance the quality of life for livestock permittees.

Groups and individuals who give a high priority to resource use would support this alternative because management actions would allow high levels of livestock grazing, coal exploration, oil and gas development, and other activities. Overall, employment and income related to BLM activities would increase by approximately 38 percent, which would potentially lead to population increases (depending on the proportion of local hires, housing availability, and other factors). However, this increase in BLM-related employment would equal only about 1 percent of total employment in the planning area. BLM program revenues and payments to counties would increase by about 4 percent under this alternative, and impacts would be most important to the smaller counties and communities. Those who give a high priority to resource use include many local residents who are concerned about economic development and its potentially positive effects on the social environment and quality of life of small communities.

Groups and individuals who give a high priority to protection of resources such as prairie ecosystems, including greater sage-grouse habitat, would feel that wildlife habitat and other related resources would not be given enough protection under this alternative. These actions would potentially result in a decline in the quality of life for these groups and individuals. American Indians who indicated concern for resources on public lands may also feel that these resources are not protected enough under this alternative.

OHV enthusiasts would continue to use the Glendive and Terry OHV areas and sensitive land in these areas would not be closed to OHV use. Alternative D is the only alternative in which opportunities to retrieve game off road would be allowed for all hunters, which would potentially create conflict and resource damage. However, it would potentially also provide desired hunting opportunities as the population aged. This alternative would not meet the needs of some groups and individuals who indicate that motorized travel should be limited to provide primitive, quiet recreation experiences. Surface disturbance allowed under this alternative would add to these concerns.

Under this alternative, OHV activities would potentially continue to cause noise, visual intrusions, and smells that made it difficult for American Indians to engage in their traditional religious practices. Mining, oil and gas development, and other activities would potentially occur in the vicinity of cultural and sacred site areas used for traditional practices. The visual and auditory disruptions from all these activities would potentially interfere with the ability of American Indians to practice their traditional religious activities in an unencumbered way, which would potentially negatively affect the quality of life of those who engaged in these practices.

ALTERNATIVE E (Proposed)

Under this alternative, 2,000 AUMs would be eliminated, which is a very small proportion of the AUMs currently authorized (less than 1 percent). RCAs would be designated to allow for greater flexibility for some permittees; however, many permittees do not favor these allotments. This alternative would be effective for invasive species control because the BLM would be able to respond to changing conditions. This alternative would maintain or enhance the quality of life for affected livestock permittees.

Although they may be concerned about oil and gas restrictions, groups and individuals who give a high priority to resource use may support this alternative because management actions would allow livestock grazing, coal exploration, some OHV use, and wood product sales to continue. Overall, employment and income related to BLM activities would increase by approximately 28 percent, which would potentially lead to population increases (depending upon the proportion of local hires, housing availability, and other factors). However, the 28-percent increase in BLM-related employment would equal less than 1 percent of total employment in the planning area. BLM program revenues and payments to counties would increase by about 2 percent under this alternative, and these impacts would be most important to the smaller counties and communities. Those who give a high priority to resource use include many local residents who are concerned about economic development and its potentially positive effects on the social environment and quality of life of small communities.

Groups and individuals who give a high priority to the protection of resources such as prairie ecosystems, including greater sage-grouse habitat, may feel that these resources would be adequately protected, which would potentially enhance their quality of life. American Indians who indicated concern for resources on public lands may also feel this alternative met their needs.

Under this alternative, OHV enthusiasts could continue to use the Glendive and Terry OHV areas but parts of these areas would be closed to OHV use. Opportunities to retrieve game off road would not be allowed under this alternative, which would potentially cause a loss of hunting opportunities as the population aged. This alternative would meet the needs of groups and individuals who feel that motorized travel should be limited to provide primitive, quiet recreation experiences. Conflict between outfitters and hunters would diminish under this alternative, and opportunities for outfitting and guiding would also be reduced.

Under this alternative, oil and gas development and OHV use would be limited; subsequently, the visual and auditory disruptions of these activities would be less likely to occur in the vicinity of cultural and sacred site areas used for traditional practices. These impacts would also reduce the likelihood that these activities would interfere with the ability of American Indians to practice their traditional religious activities in an unencumbered way, which would potentially improve the quality of life of those who engaged in these practices. However, decreased accessibility would potentially make it more difficult for aging American Indians to access areas for traditional practices.

CUMULATIVE IMPACTS

Alternative A

Groups and individuals who give a high priority to resource use, including many ranchers and other local residents, indicate that restrictions should not be placed on ongoing resource uses such as livestock grazing, oil and gas development, coal development, and other activities. This alternative would meet the needs of these people in continuing their current lifestyle and maintaining their quality of life. Off-road recreation

opportunities would be mixed because off-road game retrieval would not be allowed (although the OHV open areas would continue), which would potentially hinder the ability of an aging population to continue hunting.

Some groups and individuals believe current management is not adequate for the long-term preservation of public resources and would feel that this alternative would not offer the opportunity to address current or future problems in regard to prairie ecosystem management, including greater sage-grouse habitat. The quality of life for these people, including some American Indians, would potentially decline under this alternative. In addition, recreationists who desired a primitive, quiet experience may not feel this alternative would provide the opportunities to enhance this type of experience in the future. This alternative would potentially limit the opportunities for American Indians to practice their traditional religious activities in an unencumbered way.

Alternative B

Groups and individuals who give a high priority to resources such as prairie ecosystems, including greater sage-grouse habitat, would feel that these resources would be adequately protected and that the opportunities they desired would be available in the future. However, they may be concerned that some development would be pushed onto private land in areas in which resource protections would be less stringent. American Indians engaging in traditional religious practices would be better able to practice their religion in an unencumbered way in the future.

Opportunities for OHV use and guided recreation opportunities would be restricted and off-road travel for game retrieval would not be allowed, which would limit opportunities for an aging population. Groups and individuals who give a high priority to resource use, including many ranchers and other local residents, would feel that the proposed regulations were too extreme, which would potentially add to the concern of these residents about increasing government control over public lands and would be of particular concern in very small towns highly dependent upon agriculture and which have been experiencing population declines. The current lifestyles of these residents would potentially be affected and their quality of life would potentially decline.

Alternative C

Groups and individuals who give a high priority to the prairie ecosystem (this category would include some American Indians), including greater sage-grouse habitat, would feel that these resources would be adequately protected and that the opportunities they desired would be available in the future. Opportunities for primitive, quiet recreation experiences would improve under this alternative. OHV areas would be limited and off-road travel for game retrieval would not be allowed, which would allow American Indians to engage in traditional religious practices in an unencumbered way. Groups and individuals, who give a high priority to resource use, including many ranchers and other local residents, would support this alternative, which would potentially enhance their current lifestyle and quality of life.

Alternative D

Groups and individuals who give a high priority to resource use, including many ranchers and other local residents, indicate that restrictions should not be placed on ongoing resource uses such as livestock grazing, oil and gas development, coal development, and other activities.. Off-road recreation opportunities would be expanded; OHV open areas would continue, and off-road game retrieval by the general public would be allowed.

Some groups and individuals believe management under Alternative D would not be adequate for the long-term preservation of public resources and would feel that this alternative would not offer the opportunity to address current or future problems. Quality of life for these people, including some American Indians, would potentially decline under this alternative. In addition, recreationists who desired a primitive, quiet experience may not feel this alternative would provide this type of experience in the future.

Alternative E (Proposed)

Groups and individuals who give a high priority to the prairie ecosystem (this category would include some American Indians), including greater sage-grouse habitat, may feel that these resources would be adequately protected and that the opportunities they desired would be available in the future. Opportunities for primitive, quiet recreation experiences would improve under this alternative. OHV areas would be limited and off-road travel for game retrieval would not be allowed, which would potentially allow American Indians to engage in traditional religious practices in an unencumbered way. Groups and individuals who give a high priority to resource use, including many ranchers and other local residents, may support this alternative, although they may also feel there are too many restrictions on oil and gas development, which would potentially affect their current lifestyle and quality of life.

ENVIRONMENTAL JUSTICE

As mentioned in Chapter 3, some of the counties meet the criteria for having environmental justice populations, specifically Big Horn, Roosevelt, and Rosebud counties. All three of these counties meet the criteria discussed in Chapter 3 for environmental justice minority populations due to the high population of American Indians on reservations and off-reservation trust land across those counties. Big Horn County contains part of the Crow Reservation and Off-Reservation Trust Land and the Northern Cheyenne Indian Reservation and Off-Reservation Trust Land; Roosevelt County contains part of the Fort Peck Indian Reservation and Off-Reservation Trust Land, and Rosebud County contains part of the Northern Cheyenne Indian Reservation and Off-Reservation Trust Land. In addition to these reservations and the tribes associated with them, other tribes have historical and current cultural and traditional uses and values across the MCFO planning area. Adverse effects to historical and current cultural and traditional uses and values in this area are correlated to the amount of surface-disturbing or other disruptive activities allowed under each alternative. The effects of the different alternatives, best management practices, and mitigation to historical and current cultural and traditional uses and values, as well as cultural resources identified or nominated as special designations are described in depth under the Cultural Resources and Special Designations sections of Chapter 4.

Big Horn and Roosevelt counties also meet the criteria for environmental justice low-income populations. It is not anticipated that the low-income population in the planning area will be disproportionately impacted from planning actions. For example, any increases or decreases in employment and income or availability or use of firewood permits would be distributed amongst all segments of the local population regardless of poverty status.

Given the large geographic scale of this planning area, the environmental justice analysis was conducted at the county level. Impacts may affect specific communities or populations differently and in future MCFO planning and management actions a finer resolution environmental justice analysis may be warranted.

The BLM has considered all input from persons or groups regardless of age, income status, race, or other social or economic characteristics. The outreach and public involvement activities taken by the MCFO for this planning effort, including the consultation of tribes, are described in Chapter 5.

ECONOMICS

The economic analysis examines how the direct use of natural resources administered by the BLM affect the local economy. Using 2012 IMPLAN data as a representation of local economy's relationship to current management, economic impacts of alternative management actions are discussed in terms of jobs and income, and are estimated based on best available data, knowledge of the planning area, and professional judgment (based on observation and analysis of conditions and responses in similar areas) of resource specialists. The purpose of the economic analysis is to estimate and compare relative impacts associated with changes in BLM resource management actions under the alternative.

While economic impact analysis can be useful in assessing how changes in management actions may affect local employment and income, economic activity only reflects a fraction of natural resources' true value. Some natural resources, like forage for livestock, can easily be valued because livestock feed can be bought and sold in markets. Other resources within the MCFO, like sites of cultural or historic significance, recreational opportunities, ecological processes, and scenic views cannot be bought and sold in traditional marketplaces. Although these resources lack monetary value in the traditional sense of market prices, they are recognized as possessing non-market values which contribute to the sense of place and quality of life which attracts people to the surrounding area.

ASSUMPTIONS AND METHODOLOGY

The following analytical methods and assumptions were used to complete the analysis of economic impacts:

- Potential economic impacts are assessed using the Forest Economic Analysis Spreadsheet Tool (FEAST) developed by the U.S. Forest Service Inventory and Monitoring Institute in Fort Collins, Colorado. This tool uses a Microsoft Excel workbook as an interface between user inputs and data generated using the IMPLAN input-output modeling system (FEAST 2010). See the *Economics Appendix* for more information on the tools and methodologies used in this analysis.
- The economic analysis assesses economic impacts associated with resource outputs projected under each alternative (Table 4-75). Resource outputs in this context are the amount of a resource (e.g., forest products, AUMs, recreation visits, etc.) that would be available for use under each alternative. Average annual resource outputs were projected by resource specialists for each alternative for a 20-year planning period based on the best available information and professional judgment.

TABLE 4-75.
ANNUAL BLM OUTPUTS BY ALTERNATIVE

Resource Outputs	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation (visits)	140,909	148,781	142,875	138,093	142,875
Grazing (AUMs)	546,446	466,705	545,770	546,506	546,496
Forest Products (mbf)	621	650	650	1,100	1,100
Natural Gas (mcf)	7,962,105	7,816,842	7,972,632	7,975,789	7,928,421
Crude Oil (bbls)	5,955,000	5,824,737	5,962,895	5,968,421	5,924,211
Bentonite (short tons)	337,838	337,838	337,838	337,838	337,838
Coal (short tons)	22,487,143	22,487,143	22,487,143	22,487,143	22,487,143

- Demand for recreational experiences on BLM-administered lands within the MCFO is anticipated to increase over the planning period (personal communication with field office staff, January 2014) relative to visits depicted in chapter 3. Projected recreational visits are distributed among different trip types based on data collected by the U.S. Forest Service through the National Visitor Use Monitoring program (NVUM) (Stynes and White 2005). Since the MCFO is relatively close the Dakota Prairie National Grasslands (DPG), it is assumed that recreationists on these public lands would have similar spending profiles.
- Range revenues associated with livestock grazing on BLM-administered lands within the MCFO were calculated using the 2013 federal grazing fee of $1.35 per AUM. Costs to substitute private forage for federal forage were estimated based on the 2012 statewide average private grazing fee rate of $21.00 per AUM (U.S. Department of Agriculture 2014).
- Federal mineral development and production are assumed to occur at constant rates over the 20-year period of analysis based on the RFD's developed by mineral resource specialists (see the *Minerals Appendix*).; consequently, effects are not distinguished for development and production periods since development would not occur over predictable timeframes. For analysis purposes, development and resulting production are assumed to occur at rates averaged over the 20-year period of analysis.
- Over the long-term, timber prices are residual values determined by national and international markets based on what the final product market would pay for timber, rather than supply competition at the

local level (Lippke et al. 2006). In addition, the share of timber contributed to total harvest in the area is relatively too small to have price impacts in the short-term.

- 2012 Salary and non-salary expenditures were reported by the Field Office and assumed to reflect MCFO's average annual budget. Non salary-related expenditures were allocated to different economic sectors based on data compiled for the Dakota Prairie National Grasslands. Since these public lands are managed similarly and close in proximity, the DPG was assumed to be a reasonable proxy in the absence of detailed field office information.
- Regional economic impacts are estimated based on the assumption of full implementation of each alternative. The actual changes in the economy would depend on individuals taking advantage of the resource-related opportunities that would be supported by each alternative. If market conditions or trends in resource use were not conducive to developing some opportunities, the impact on the economy would be different than estimated here.
- Economic impacts discussed in this analysis include direct, indirect, and induced effects. Direct employment would, for example, be generated in the grazing sector. Additional employment would be generated as the affected livestock operators purchase services and materials as inputs ("indirect" effects) and ranchers spend their earnings within the local economy ("induced" effects). Direct, indirect, and induced effects are combined in the discussion of effects.

IMPACTS COMMON TO ALL ALTERNATIVES

Implementation of all alternatives would comply with all valid existing rights, federal regulations, BLM policies, and other requirements. Under all alternatives, BLM-related economic contributions, i.e. jobs and labor income, would continue to support about 3 percent of the local employment and labor income within the impact area economy, but could be more important for smaller communities within the planning area (Table 4-76). Thus, the contribution of MCFO-related activities to the local economy and the relative differences between the alternatives would not be large enough to cause measurable impacts to economic diversity (the number of economic sectors) or economic dependency (which occurs when the local economy is dominated by a limited number of industries). Shifts in emphasis could occur, but these would not result as a consequence of planning actions in this RMP/EIS. The alternatives do have the potential to impact local businesses and individuals within individual sectors. For example, BLM-related contributions depicted in Table 4-76 indicate BLM is attributable to 9 percent of employment in the agricultural industry and 8 percent of the mining industry. As a result changes to BLM minerals and grazing management, discussed under the alternatives, will affect these sectors and individuals employed in these sectors to a greater degree than effects to the overall economy.

TABLE 4-76.
CURRENT ROLE OF MCFO-RELATED CONTRIBUTIONS TO THE AREA ECONOMY

Contribution Area	Employment (jobs)		Income (Thousands of 2012	
Industry	Area Totals	BLM-Related	Area Totals	BLM-Related
Agriculture, Forestry, Fishing and Hunting	9,537	859	$203,950	$4,980
Mining	4,068	329	$340,918	$22,617
Utilities	801	8	$104,512	$1,087
Construction	3,684	64	$178,692	$3,334
Manufacturing	780	8	$32,395	$395
Wholesale trade	1,638	32	$91,705	$2,049
Retail trade	2,578	54	$190,481	$2,478
Transportation and warehousing	5,077	85	$146,134	$2,499
Information	746	12	$38,027	$620
Finance and insurance	2,251	52	$69,809	$2,336
Real estate, rental, and leasing	1,121	54	$27,792	$1,193
Professional, scientific, and technical services	2,058	38	$64,174	$1,482
Management of companies	49	2	$3,731	$158
Administration, waste management, and removal services	1,194	26	$21,424	$526
Educational services	887	7	$16,479	$153

Health care and social assistance	4,860	64	$204,009	$2,928
Arts, entertainment, and recreation	1,282	22	$17,905	$322
Accommodations and food services	3,791	87	$63,639	$1,517
Other services	3,365	43	$77,450	$1,161
Government	11,852	211	$586,317	$17,185
Total	61,619	2,056	2,479,542	69,019
BLM as Percentage of Total (%)	---	3.34%	---	2.78%

IMPLAN, 2012

Recreation: BLM-administered lands within the MCFO would continue to support a wide range of recreational experiences which contribute to local quality of life and stimulate economic activity under all alternatives. Based on trends in regional population growth and FO visitation, recreational use of public lands administered by the MCFO is anticipated to increase under all alternatives (personal communication with field office staff).
Livestock Grazing: Grazing would continue to be authorized on BLM-administered lands within the Miles City Field Office under the Taylor Grazing Act and FLPMA. The FO's range program would continue to provide permitted ranchers access with to additional forage while maintaining the long-term health and viability of federal rangelands. While federal grazing allotments administered by the MCFO account for a portion of total forage within the study area, this forage is fundamental to the financial security of local ranches. In addition, these allotments are often intermingled with operations on private land and provide seasonal forage as a compliment to other sources on state, private and other federal lands.

Future availability of federal forage in the study area is likely to vary annually based on environmental conditions and management actions proposed under the alternatives. While changes to active authorized AUMs may occur over the planning period, livestock grazing on BLM allotments within the MCFO is anticipated to continue to support economic activity in the agricultural sector and contribute to local employment and income under all alternatives. Forage is essential to supporting ranching across the study area. Federal grazing permits are traditionally passed down from generation to generation by ranching families who view raising livestock as their livelihood. Many ranching operations include family members working off-ranch in order to support their families and their ranching operations. The economic development for private ranchers and ranching communities, supported by MCFO's rangeland management, contributes to the sustainability of ranching operations in the planning area.

Mineral Development: Leasing and development of federal minerals would continue under all alternatives. Continued mineral development within the MCFO includes crude oil, natural gas, coal, and bentonite. The amount of bentonite mined on federal lands is a function of market demand, more so than a function of amount of land available to mine. Over the next 20 years, market demand for bentonite is anticipated to remain relatively constant. Nominal increases in market demand for bentonite are anticipated to result in static production with annual production on BLM-administered lands within the MCFO ranging between 300,000 to 350,000 tons per year under all alternatives. Bentonite is a locatable mineral and the state collects about $473,000 from bentonite mining activities within the MCFO, under the Montana Bentonite Production Tax. Since 2014, 77.95 percent of this tax revenue is disbursed to the counties of production (Title 15-39-101 MCA and Title 15-39-110 MCA).

Leasing and development of coal on BLM-administered lands within the MCFO are anticipated to increase under all alternatives. Within the next 20 years an additional 2,242 acres of federal minerals are anticipated to be leased for coal development within the field office. In total, 31,541 acres of the MCFO would be leased for coal development. Average annual coal production associated with the MCFO is anticipated to increase by approximately 34 percent once pending coal leases are authorized. Over the next 20 years, 22,487,143 tons of coal are anticipated to be extracted from BLM-administered lands in the MCFO on annual average (Table 4-75). Rents and royalties associated with coal development on these lands is anticipated to generate about $25.9 million in federal revenue (Tables 4-80 and 4-81), with a portion being distributed back to the counties in which it was generated. In total, the 17-county study area is anticipated to receive more than $3 million on annual average from coal development on MCFO's administered lands (Table 4-81).

Employment and income associated with bentonite and coal extraction are combined with oil and gas development and discussed under the *Minerals* section for each alternative.

Lands and Realty: MCFO would continue to authorize the use of a right of way over, upon, under, or through public lands for construction, maintenance, and termination of a project for a specified period of time through ROW grants. Within the field office, ROWs have been authorized for roads, pipelines, transmission lines, communication sites, and other utility conveyances. On annual average these ROWs are anticipated to generate more than $43,000 in rental fees paid to the federal government. There is no statutory authority to share FLPMA ROW revenues with states or counties, but these revenues are factored into annual PILT calculations.

Renewable Energy: Wind energy development is anticipated with each of the alternatives. There would be one ROW issued for a utility-scale (see BLM IM 2009-013) wind energy project in the planning area in the short-term. The project would include a minimum of 25 1.5-megawatt turbines. The annual rental revenue to the federal government would be $4,155 per megawatt of the total installed capacity of the wind energy project on public lands. There is no statutory authority to share FLPMA ROW revenues with states or counties.
Payments to Counties: For the purposes of analysis, it is assumed that communities containing BLM-administered lands administered by the MCFO would continue to receive annual Payments in Lieu of Taxes (PILT) from the federal government to help offset losses in property taxes due to the nontaxable status of Federal lands. Since population, entitlement acreage, and prior year's federal revenue sharing are all factored in to the formula for PILT payments, it is difficult to predict future PILT payments with certainty. While it is not possible to determine how PILT and local property taxes might changes over the planning period, total PILT payments to counties within the study area are anticipated to remain relatively constant in the short-run.

BLM Expenditures: For the purposes of analysis, it is assumed that MCFO's expenditures for BLM employee salaries and program operations would continue to be about $19.43 million annually ($9.4 million for labor and $10 million for non-labor expenditures). The BLM offices within the planning area would continue to employ about 47 permanent employees and 31 non-permanent employees. Non-salary expenditures are purchases made in support of resource programs and operations and include items such as contracts, gasoline, diesel, and computer equipment. Operations expenditures also include contracts and cooperative agreements, trail maintenance, fuels treatments, invasive weed treatments, and other activities related to ecosystem restoration and range improvements.

Non-market Values: Amenities or the natural, cultural, and social characteristics of an area have played an increasing role in U.S. migration and population growth across the West. Areas characterized as having high levels of natural amenities have been shown to experience greater population growth than areas with fewer natural amenities (Rudzitis and Johansen 1991, Johnson and Beale 1994, Beale and Johnson 1998, McGranahan1999, Hunter et. al 1999, Frentz et. al 2004), and this growth has been observed increasingly at the boundaries of public lands (Hansen et. al 1998, Radeloff et. al 2001). While natural amenities and non-market values do not directly generate income in the same sense as livestock production or mineral development, they contribute to healthy economies and lifestyles. Open spaces, scenic views, and proximity to outdoor recreation opportunities have been found to have positive effects on property values and have been attributed with increasing the attractiveness of communities as places to live and work (Kroeger, 2008).

Many non-market use-values exist for natural resources administered by the BLM within the MCFO. Non-market values can be broken down into two categories: use and non-use values. Use values include benefits people derive from the direct use (i.e. consumptive, recreational, spiritual, and inspirational uses) and indirect use (i.e. regulating ecological services such as climate control, water and air purification, and pest and disease control). Non-use, or passive use, values associated with the MCFO reflect the value of its natural resources beyond their current use. These benefits are accrued from existence, option and bequest values. Existence values reflect the benefit people receive from knowing that BLM administered lands exist. Additional existence values for the MCFO may be associated with unique historical sites and scenic undeveloped landscapes. In addition to existence values, some people may receive benefits from knowing there is a possibility to visit BLM administered lands within the MCFO in the future. These benefits are referred to as option values when future use is expected to occur within the same generation and bequest values when preservation allows future generations to benefit from resource use. Within the MCFO bequest and option values might exist for numerous plant and animal species, wild and scenic landscapes, and recreational trails.

Consistent with IM 2013-131, no attempt has been made, within this planning process, to assign monetary values to non-market values within the MCFO because these values are difficult to quantify at this analysis

level (BLM 2013). The Alternatives involve different approaches to, and levels of, vegetation treatment and wildfire management. However, the fact that no monetary value is assigned to non-market values in this document does not lessen their importance in the decision making process. For example, fuels treatments should contribute to fuels conditions that would be less likely to have unplanned fire starts. This would reduce the threat to life and property. For example, fires generally burn hotter, flame length is higher, and fires in tree canopies are more likely in non-treated areas. It is not possible, however, to project the level of wildfire that would occur under any of the Alternatives. While not quantified, relevant non-market values are represented throughout the FEIS in other resource sections of this document.

ALTERNATIVE A (No Action)

Alternative A is the no action alternative. Under this alternative, there would be no change to current management direction. Anticipated resource management actions, resource outputs, and projected BLM revenues under this alternative are anticipated to stimulate economic activity in the local economy and support local employment opportunities in nearly every sector of the local economy. Estimated BLM-related average annual employment and labor income are summarized by resource program areas in Tables 4-77 and 4-78.

TABLE 4-77.
ANNUAL AVERAGE EMPLOYMENT BY PROGRAM BY ALTERNATIVE

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation *(local)*	21	23	22	21	22
Recreation *(non-local)*	59	62	59	57	59
Grazing	1,039	882	1,037	1,039	1,039
Timber	5	5	5	8	8
Minerals	606	579	607	608	589
Payments to States/Counties	217	214	217	217	216
BLM Expenditures	186	186	186	186	186
Total BLM Supported	2,132	1,950	2,133	2,136	2,119

IMPLAN, 2012

TABLE 4-78.
ANNUAL AVERAGE LABOR INCOME BY PROGRAM BY ALTERNATIVE ($1,000s)

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation	$2,003	$2,115	$2,031	$1,963	$2,031
Grazing	$13,550	$11,624	$13,534	$13,551	$13,551
Timber	$369	$385	$385	$656	$656
Minerals	$34,983	$32,688	$35,028	$35,059	$33,231
Payments to States/Counties	$9,347	$9,224	$9,350	$9,355	$9,317
BLM Expenditures	$40,731	$38,809	$40,761	$40,987	$41,017
Total BLM Supported	$100,982	$94,844	$101,089	$101,571	$99,802

IMPLAN, 2012

Recreation: Recreation management would continue under current guidance and policy under Alternative A. While management of recreational resources would not change under this alternative, demand for outdoor recreation experiences supported by these lands is anticipated to continue to steadily increase. Based on trends between 2004 and 2009, visitation to the MCFO is estimated to increase by approximately 4 percent annually. Over the next 20 years, these BLM-administered lands are anticipated to support 140,909 visits on annual average. Recreational experiences supported by BLM-administered lands within the MCFO would continue to contribute to the overall quality of life enjoyed by local residents and attract visitors from outside the study area. Projections for average annual visits under Alternative A include more than 80,000 local visits and 60,000 non-

local visits. Approximately 67 percent of average annual visits to MCFO lands are anticipated to be wildlife related which includes hunting, fishing, and wildlife viewing.

As discussed in the existing conditions, these public lands support a wide range of outdoor experiences which contribute to the quality of life and sense of place in many surrounding communities. Outdoor recreation also stimulates economic activity in numerous industrial sectors that support the travel and tourism industry. Opportunities for recreation under Alternative A are estimated to support approximately 80 jobs and $2 million in labor income across the 17-county study area. Approximately 59 of the estimated jobs and $1.4 million in local labor income would be supported by non-local recreation (Table 4-77 and Table 4-78).
Livestock Grazing: Alternative A would continue to authorize approximately 546,466 AUMs annually and support approximately 1,039 jobs and $13.5 million in labor income (Table 4-77 and Table 4-78). Livestock grazing on BLM-administered land in the 17-county planning area would continue to involve approximately the same number of operators. The economic dependence of livestock producers on BLM-administered forage would also remain unchanged and BLM-administered forage would continue to comprise a critical element of some livestock producers' complement of grazing, forage, and hay production. Annual federal revenues from livestock grazing fees would continue to be about $737,786 annually, of which about $137,851 would be distributed back to the counties (Table 4-81).

***Ecosystem Restoration and Forest Products*:** MCFO would continue to provide forest products for commercial and personal use under current management (Table 4-79). On annual average, 621 ccf of softwood sawtimber and 86 posts are anticipated to be harvested within the MCFO. Approximately 90 percent of poles are anticipated to be used for personal use. Under this alternative, the MCFO would continue to issue about 48 personal use permits (including Christmas tree and firewood permits) annually. Revenues collected from timber product sales and permits are estimated to generate about $30,000 in federal revenue (Table 4-81). Four percent of non-stewardship timber receipts are returned through the state to the counties of origin. Timber management under Alternative A would continue to support approximately 5 jobs and $369,000 in total labor income in the local economy (Table 4-77 and Table 4-78).

TABLE 4-79.
ANNUAL TIMBER HARVEST BY ALTERNATIVE

Treatment	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Sawtimber, fuel wood, post/poles, and house logs ccf (100 cubic feet)	621 mbf = 169 acres	650 mbf	650 mbf	1,100 mbf	1,100 mbf
Personal use permits (firewood and Christmas trees)	48	60	60	60	60
Timber Revenues, all products	$30,500	$32,000	$32,000	$54,000	$54,000
Salvage Sales	$7,100	$7,100	$7,100	$7,100	$7,100

Mineral Development: While management of BLM's mineral resources within the MCFO would not change under Alternative A, leasing and development of federal minerals administered by the MCFO are anticipated to increase over the 20 year planning period. Future federal mineral development associated with these public lands would include crude oil, natural gas, coal, and bentonite. Bentonite and coal production are discussed above under the *Impacts Common to All Alternatives* section, anticipated oil, natural gas, and revenues associated with federal leasable minerals are reported in Table 4-80.

Approximately 887,000 acres of unleased federal minerals administered by the BLM would be available annually for leasing under alternative A. Over the next 20 years leasing and development of these minerals is forecasted to increase. Annual average federal oil production is anticipated to increase by approximately 6 percent over the current production of 5.59 million barrels. On annual average federal oil production associated with minerals leased from the MCFO are anticipated to reach 5,955,000 bbls per year. Over the next 20 years, 1,589 new wells are anticipated to be drilled on federal mineral leases within the field office. Approximately 16 percent of these wells are anticipated to be dry wells. On annual average, 70 producing oil and gas wells (20 oil wells and 24 conventional gas wells), 26 CBNG wells, and 13 dry wells would be drilled per year.

Approximately 95 percent of the production would come from three areas: the Cedar Creek Anticline (Fallon and Wibaux counties), the northeast Williston Basin (Richland and Sheridan counties), and the Powder River Basin (Carter, Powder River, and Rosebud counties). The remainder would occur in the Poplar Dome area (Roosevelt County) and the Porcupine Dome area (Rosebud County).

Federal natural gas production is anticipated to increase by approximately 5 percent over the current production of 7.56 million MCF. On annual average federal natural gas production associated with minerals leased from the MCFO are anticipated to reach 7,962,105 MCFs per year. Two thirds of new production would be from conventional natural gas wells. Approximately 80 percent would occur in the Cedar Creek Anticline (Fallon and Wibaux counties). The remainder would occur in the Poplar Dome area (Roosevelt County), the Porcupine Dome area (Rosebud County), and throughout the planning area. All of the CBNG production would occur in the Powder River Basin in Big Horn, Powder River, and Rosebud counties.

TABLE 4-80.
ESTIMATED ANNUAL IN FEDERAL
MINERAL PRODUCTION AND ACTIVITY BY ALTERNATIVE

Commodity or Activity	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres currently leased for oil and gas	890,304	890,304	890,304	890,304	890,304
Unleased acres available for leasing	887,305	887,305	887,305	887,305	887,305
Avg Annual oil and gas rents[1]	$2,763,061	$2,763,061	$2,763,061	$2,763,061	$2,763,061
Natural gas production (mcf)					
Federal production associated with BLM minerals	7,962,105	7,816,842	7,972,632	7,975,789	7,928,421
*Avg Annual Natural Gas Royalties @ $5.11/mcf[2]	$5,085,795	$4,993,008	$5,092,518	$5,094,536	$5,064,279
Oil production (bbl)					
Federal production associated with BLM minerals	5,955,000	5,824,737	5,962,895	5,968,421	5,924,211
*Avg Annual Oil Royalties @ $88.61/bbl[2]	$65,959,069	$64,516,241	$66,046,513	$66,107,724	$65,618,037
Coal production (short tons)					
Acres currently leased for coal	29,299	29,299	29,299	29,299	29,299
Acres with pending leases	2,242	2,242	2,242	2,242	2,242
Avg Annual Coal Rents[3]	$94,623	$94,623	$94,623	$94,623	$94,623
Federal production associated with BLM minerals	22,487,143	22,487,143	22,487,143	22,487,143	22,487,143
**Avg Annual Coal Royalties at $9.91/ton[4]	$25,872,605	$25,872,605	$25,872,605	$25,872,605	$25,872,605

***IPPA 2013**
****EIA, 2013**
[1]Estimated based on assumption 50% of leased acres are in the first 5 years of their lease and 50% are in the last 5 years of their lease
[2]Royalties are assessed at 12.5% of the value of production. OBPP, 2013
[3]Annual rent on coal leases is $3/acres
[4]Royalties are assessed at 11.61% of the value of production. OBPP, 2013

It is estimated that the exploration, development, and production of bentonite, coal, oil, and natural gas administered by the MCFO would support a total of 606 local jobs and an estimated $35 million in local labor income on annual average (Table 4-77 and Table 4-78). Annual rents and royalties associated with leasing and production of federal minerals within the MCFO are anticipated to generate more than $99.8 million in public revenue collected by the federal government on annual average over the planning period (Table 4-80. Based on recent bonus bids for leases within the MCFO, one-time bonus bids for new federal mineral leases could generate about $3.8 million in federal revenue annually. In accordance with the statutes discussed in *the Payments to Counties* section of the *Economics Appendix,* a portion of these federal revenues would be

distributed back to the State of Montana and to counties affected by the leasing and development of federal minerals leased from the MCFO. It is estimated that leasing and development of MCFO's mineral resources would generate approximately $104 million with $36.5 million being redistributed back to the state with $13.6million of federal revenues distributed back to local governments across the 17-county study area (Table 4-81).

Payments to Counties: Revenue-sharing programs administered by the Bureau of Land Management entitle local governments to a portion of receipts derived from the use, extraction, or sale of natural resources on BLM-administered lands within their jurisdiction; as well as, payments in lieu of taxes (PILT) that would have been received if these federal lands were privately owned. PILT payments are discussed above in the Payments to Counties section under Impacts Common to All Alternatives. Federal, state, and county revenues associated with resources within the MCFO are reported in Table 4-81. Federal natural resource related revenues distributed back to state and local governments help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems. Average annual natural resource related revenues anticipated to be distributed back to the study area are shown in Table 4-81.

While these payments only account for a portion of total natural resource related revenue distributed to counties across the 17-county study area, local rural communities rely heavily on these payments to cover basic operating costs and to fund public schools and roads. Salary and non-salary expenditures funded with these revenues are estimated to support a total of 217 local jobs and $9 million in local wages and income throughout the study area on annual average (Tables 4-77 and Table 4-78).

TABLE 4-81.
ANNUAL AVERAGE REVENUE COLLECTED ON BLM RESOURCES BY ALTERNATIVE

Resource Outputs	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Federal Revenue					
Right of Ways	$43,465	$43,465	$43,465	$43,465	$43,465
Grazing	$737,786	$674,343	$736,725	$737,783	$737,770
Coal	$25,967,228	$25,967,228	$25,967,228	$25,967,228	$25,967,228
Oil and Gas	$77,598,047	$76,062,433	$77,692,215	$77,755,443	$77,235,500
Timber Non-salvage	$23,400	$24,900	$24,900	$46,900	$46,900
Timber salvage	$7,100	$7,100	$7,100	$7,100	$7,100
State Revenue					
Coal	$9,542,956	$9,542,956	$9,542,956	$9,542,956	$9,542,956
Bentonite	$104,247	$104,247	$104,247	$104,247	$104,247
Oil and Gas	$26,806,245	$26,275,768	$26,838,776	$26,860,618	$26,681,003
County Revenue					
PILT	$2,720,976	$2,720,976	$2,720,976	$2,720,976	$2,720,976
Grazing	$137,851	$119,359	$130,400	$130,588	$130,585
Coal	$3,180,985	$3,180,985	$3,180,985	$3,180,985	$3,180,985
Bentonite	$368,527	$368,527	$368,527	$368,527	$368,527
Oil and Gas	$10,099,386	$9,899,526	$10,111,642	$10,119,871	$10,052,200
Timber Non-Salvage	$936	$996	$996	$1,876	$1,876

BLM Expenditures: As discussed above under the *Impacts Common to All Alternatives* section, MCFO's salary and non-salary expenditures are assumed to be about $19.43 million annually ($9.4 million for labor and $10 million for non-labor expenditures). The BLM is anticipated to continue to employ about 47 permanent employees and 31 non-permanent employees to manage the MCFO.

ALTERNATIVE B

Recreation: Investment and improvements to MCFO's recreational resources under Alternative B are anticipated to enable the field office to support a 10-percent increase in annual average visits when compared to future recreational use under current management. Over the next 20 years, MCFO's lands are anticipated to support 148,781 visits on annual average. Recreational experiences supported by BLM-administered lands within the MCFO would continue to contribute to the overall quality of life enjoyed by local residents and attract visitors from outside the study area. Projections for average annual visits under Alternative B include approximately 84,805 local visits and 63,976 non-local visits. Approximately 67 percent of average annual visits to MCFO lands are anticipated to be wildlife-related which includes hunting fishing, and wildlife viewing.

As discussed in the existing conditions, these public lands support a wide range of outdoor experiences which contribute to the quality of life and sense of place in many surrounding communities. Outdoor recreation also stimulates economic activity in numerous industrial sectors that support the travel and tourism industry. Opportunities for recreation under Alternative B are estimated to support approximately 85 jobs and $2.1 million in labor income across the 17-county study area. Approximately 62 of the estimated jobs and $1.5 million in local labor income would be supported by non-local recreation (Table 4-77 and Table 4-78).

Livestock Grazing: Alternative B would continue to authorize livestock grazing on BLM-administered lands. Under this alternative, BLM-administered forage would continue to fulfill a seasonal niche and contribute to the financially viability of permittees. Livestock grazing under Alternative B, especially domestic sheep and goats, would, however, be restricted to meet biological resource objectives. These restrictions would result in an 8.5 percent reduction in the number of AUMs authorized annually. Under this alternative, permittees would be authorized to use up to 466,705 AUMs annually. While decreases in livestock grazing on BLM-administered lands are not anticipated to cripple the region's livestock industry, reduced access to federal forage would have adverse effects on individual ranchers and consequently, the ranching way of life. Proposed restrictions and closures would limit access to critical seasonal forage, making it more difficult for operations to sustain current herd sizes. The financial burden of trying to offset federal forage losses with more expensive private forage or supplement feed could force some local ranchers to transition land and other ranch resources from livestock production to other agricultural uses or abandon agricultural practices all together.

In terms of local area contributions from BLM supplied forage, permitted use levels of allotments administered by the MCFO would support 882 total jobs and approximately $11.6 million in local labor income (including direct, indirect and induced wages and proprietor's income) on an average annual basis. Public revenues associated with the redistribution of federal grazing fees would support additional employment and income. Under the alternatives grazing associations and individual permit holders would continue to pay federal grazing fees which are anticipated to generate $674,343 in federal revenue. In accordance with federal and state statutes, the 17-county study area is anticipated to receive a total of $119,359 in grazing revenues to fund general government functions, public schools, and roads in the counties where revenue was generated. See the Economics Appendix for more information on how these revenues were calculated.

***Ecosystem Restoration and Forest Products*:** MCFO would continue to provide forest products for commercial and personal use under Alternative B. On annual average, 650 mbf of softwood sawtimber and 108 posts are anticipated to be harvested within the MCFO. Approximately 90 percent of poles are anticipated to be used for personal use. Under this alternative, the MCFO would increase personal use permits (including Christmas tree and firewood permits) to 60 permits a year. Revenues collected from timber product sales and permits are estimated to generate a little more than $30,000 in federal revenue. Four percent of non-stewardship timber receipts are returned through the state to the counties of origin. Timber management under Alternative B would continue to support approximately 5 jobs and $385,000 in total labor income in the local economy (Table 4-77 and Table 4-78).

Mineral Development: Future federal mineral development under Alternative B would include crude oil, natural gas, coal, and bentonite. Under this alternative, potential future development would be less under this alternative than under other action alternatives. Bentonite and coal production are discussed above under the *Impacts Common to All Alternatives* section. Anticipated oil, natural gas, and revenues associated with federal leasable minerals are reported in Table 4-80.

Approximately 887,000 acres of unleased federal minerals administered by the BLM would be available for leasing under Alternative B. This is less than under Alternative A and consequently less production is anticipated under this alternative than under Alternative A. Although fewer acres of federal minerals would be administratively available for leasing under this alternative when compared to the other alternatives, leasing and development of federal minerals under Alternative B could still increase from current levels if additional production occurs as forecasted in Table 4-80. Under Alternative B, annual average federal oil production is anticipated to increase by approximately 4 percent over the current production of 5.59 million barrels. On annual average federal oil production associated with minerals leased from the MCFO are anticipated to reach 5,824,737 bbls per year. Over the next 20 years, 1,033 new wells are anticipated to be drilled on federal mineral leases within the field office. Approximately 16 percent of these wells are anticipated to be dry wells. On annual average, 28 producing oil and gas wells (15 oil wells and 13 conventional gas wells), 18 CBNG wells, and 9 dry wells would be drilled per year. Approximately 95 percent of the production would come from three areas: the Cedar Creek Anticline (Fallon and Wibaux counties), the northeast Williston Basin (Richland and Sheridan counties), and the Powder River Basin (Carter, Powder River, and Rosebud counties). The remainder would occur in the Poplar Dome area (Roosevelt County) and the Porcupine Dome area (Rosebud County).

Federal natural gas production is anticipated to increase by approximately 3 percent over current production of 7.56 million MCF. On annual average federal natural gas production associated with minerals leased from the MCFO are anticipated to reach 7,816,842 MCFs per year. Two thirds of new production would be from conventional natural gas wells. Approximately 80 percent would occur in the Cedar Creek Anticline (Fallon and Wibaux counties). The remainder would occur in the Poplar Dome area (Roosevelt County), the Porcupine Dome area (Rosebud County), and throughout the planning area. All of the CBNG production would occur in the Powder River Basin in Big Horn, Powder River, and Rosebud counties.

It is estimated that the exploration, development, and production of bentonite, coal, oil, and natural gas administered by the MCFO would support a total of 579 local jobs and an estimated $32.7 million in local labor income on annual average (Table 4-77 and Table 4-78). Annual rents and royalties associated with leasing and production of federal minerals within the MCFO are anticipated to generate more than $98.2 million in public revenue (Table 4-80). Based on recent bonus bids for leases within the MCFO, one-time bonus bids for new federal mineral lease could generate about $3.8 million in federal revenue annually. In accordance with the statutes discussed in the *Payments to Counties* section of the *Economics Appendix*, a portion of these federal revenues would be distributed back to the State of Montana and to counties affected by the leasing and development of federal minerals leased from the MCFO. It is estimated that revenues associated with MCFO's mineral resources would generate approximately $102 million in federal revenue with $35.9 million being redistributed back to the state with $13.4million of federal revenues being distributed back to local governments across the 17-county study area on an annual average basis (Table 4-81).

Payments to Counties: Revenue-sharing programs administered by the Bureau of Land Management entitle local governments to a portion of receipts derived from the use, extraction, or sale of natural resources on BLM-administered lands within their jurisdiction; as well as, payments in lieu of taxes (PILT) that would have been received if these federal lands were privately owned. PILT payments are discussed above in the Payments to Counties section under *Impacts Common to All Alternatives.* Federal, state, and county revenues associated with resources within the MCFO are reported in Table 4-81. Federal natural resource related revenues distributed back to state and local governments help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

Average annual natural resource related revenues anticipated to be distributed back to the study area are shown in Table 4-81. While these payments only account for a portion of total natural resource related revenue distributed to counties across the 17-county study area, local rural communities rely heavily on these payments to cover basic operating costs and to fund public schools and roads. Salary and non-salary expenditures funded with these revenues are estimated to support more than 214 local jobs and $9 million in local wages and income throughout the study area (Tables 4-77 and Table 4-78).

BLM Expenditures: As discussed above under the *Impacts Common to All Alternatives* section, MCFO's salary and non-salary expenditures are anticipated to be about $19.43 million annually ($9.4 million for labor and $10 million for non-labor expenditures). The BLM is anticipated to continue to employ about 47 permanent employees and 31 non-permanent employees to manage the MCFO.

ALTERNATIVE C

Recreation: Investment and improvements to MCFO's recreational resources under Alternative C are anticipated to enable the field office to support a 6-percent increase in annual average visits when compared to future recreational use under current management. Over the next 20 years, MCFO's lands are anticipated to support 142,875 visits on annual average. Recreational experiences supported by BLM-administered lands within the MCFO would continue to contribute to the overall quality of life enjoyed by local residents and attract visitors from outside the study area. Projections for average annual visits under Alternative C include approximately 81,439 local visits and 61,436 non-local visits. Approximately 67 percent of average annual visits to MCFO lands are anticipated to be wildlife-related which includes hunting fishing, and wildlife viewing.

As discussed in the existing conditions, these public lands support a wide range of outdoor experiences which contribute to the quality of life and sense of place in many surrounding communities. Outdoor recreation also stimulates economic activity in numerous industrial sectors that support the travel and tourism industry. Opportunities for recreation under Alternative C are estimated to support approximately 81 jobs and $2. million in labor income across the 17-county study area. Approximately 59 of the estimated jobs and $1.4 million in local labor income would be supported by non-local recreation (Table 4-77 and Table 4-78).

Livestock Grazing: Alternative C would continue to authorize livestock grazing on BLM-administered lands. Under this alternative, BLM-administered forage would continue to fulfill a seasonal niche and contribute to the financially viability of permittees. Livestock grazing under Alternative C, especially domestic sheep and goats, would, however, be restricted to meet biological resource objectives. These restrictions would result in a less than 0.5 percent reduction in the number of AUMs authorized annually. Under this alternative, permittees would be authorized to use up to 545,770 AUMs annually. While decreases in livestock grazing on BLM-administered lands are not anticipated to significantly affect the region's livestock industry, reduced access to federal forage would have adverse effects on individual ranchers and, consequently, the ranching way of life. Proposed restrictions and closures would limit access to critical seasonal forage, making it more difficult for operations to sustain current herd sizes. The financial burden of trying to offset even relatively small federal forage losses with more expensive private forage or supplement feed would force some local ranchers to transition land and other ranch resources from livestock production to other agricultural uses or abandon agricultural practices all together.

In terms of local area contributions from BLM supplied forage, permitted use levels of allotments administered by the MCFO would continue to support 1,037 total jobs and approximately $13.5 million in local labor income (including direct, indirect and induced wages and proprietor's income) on an average annual basis. Public revenues associated with the redistribution of federal grazing fees would support additional employment and income. Under the alternatives grazing associations and individual permit holders would continue to pay federal grazing fees which are anticipated to generate $ 736,724 in federal revenue. In accordance with federal and state statutes, the 17-county study area is anticipated to receive a total of $ 130,400 in grazing revenues to fund general government functions, public schools, and roads in the counties where revenue was generated. See the Economics Appendix for more information on how these revenues were calculated.

Ecosystem Restoration and Forest Products**:** MCFO would continue to provide forest products for commercial and personal use under Alternative C. On annual average, 650 mbf of softwood sawtimber and 108 posts are anticipated to be harvested within the MCFO. Approximately 90 percent of poles are anticipated to be used for personal use. Under this alternative, the MCFO would increase personal use permits (including Christmas tree and firewood permits) to 60 permits a year. Revenues collected from timber product sales and permits are estimated to generate about $32,000 in federal revenue. Four percent of non-stewardship timber receipts are returned through the state to the counties of origin. Timber management under Alternative C would continue to support approximately 5 jobs and $385,000 in total labor income in the local economy (Table 4-77 and Table 4-78).

Mineral Development: Future federal mineral development associated with these public lands under Alternative C would include crude oil, natural gas, coal, and bentonite. Under this alternative, leasing and development of federal minerals administered by the MCFO are anticipated to increase over the 20 year planning period. Bentonite and coal production are discussed above under the *Effects Common to All Alternatives* section, anticipated oil, natural gas, and revenues associated with federal leasable minerals are reported in Table 4-80

Approximately 887,000 acres of unleased federal minerals administered by the BLM would be available for leasing under Alternative C. Under this alternative, annual average federal oil production is anticipated to increase by approximately 7 percent over the current production of 5.59 million barrels. On annual average federal oil production associated with minerals leased from the MCFO are anticipated to reach 5,962,895 bbls per year. Over the next 20 years, 1,618 new wells are anticipated to be drilled on federal mineral leases within the field office. Approximately 16 percent of these wells are anticipated to be dry wells. On annual average, 45 producing oil and gas wells (24 oil wells and 21 conventional gas wells), 26 CBNG wells, and 14 dry wells would be drilled per year. Approximately 95 percent of the production would come from three areas: the Cedar Creek Anticline (Fallon and Wibaux counties), the northeast Williston Basin (Richland and Sheridan counties), and the Powder River Basin (Carter, Powder River, and Rosebud counties). The remainder would occur in the Poplar Dome area (Roosevelt County) and the Porcupine Dome area (Rosebud County).

Federal natural gas production is anticipated to increase by approximately 5 percent over the current production of 7.56 million MCF. On annual average federal natural gas production associated with minerals leased from the MCFO are anticipated to reach 7,972,632 MCFs per year. Two thirds of new production would be from conventional natural gas wells. Approximately 80 percent would occur in the Cedar Creek Anticline (Fallon and Wibaux counties). The remainder would occur in the Poplar Dome area (Roosevelt County), the Porcupine Dome area (Rosebud County), and throughout the planning area. All of the CBNG production would occur in the Powder River Basin in Big Horn, Powder River, and Rosebud counties.

It is estimated that the exploration, development, and production of bentonite, coal, oil, and natural gas administered by the MCFO would support a total of 607 local jobs and an estimated $35.0 million in local labor income on annual average (Table 4-77 and Table 4-78). Annual rents and royalties associated with leasing and production of federal minerals within the MCFO are anticipated to generate more than $99.8 million in public revenue over the planning period. (Table 4-80). Based on recent bonus bids for leases within the MCFO, one-time bonus bids for new federal mineral lease could generate about $3.8 million in federal revenue annually. In accordance with the statutes discussed in *the Payments to Counties* section of the *Economics Appendix,* a portion of these federal revenues would be distributed back to the State of Montana and to counties affected by the leasing and development of federal minerals leased from the MCFO. It is estimated that leasing and development of MCFO's mineral resources would generate approximately $103.6 million in federal revenue with $36.5 million being redistributed back to the state with and an additional $13.7 million of federal revenues being distributed to local governments across the 17-county planning area (Table 4-81).

Payments to Counties: Revenue-sharing programs administered by the Bureau of Land Management entitle local governments to a portion of receipts derived from the use, extraction, or sale of natural resources on BLM-administered lands within their jurisdiction; as well as, payments in lieu of taxes (PILT) that would have been received if these federal lands were privately owned. PILT payments are discussed above in the Payments to Counties section under Impacts Common to All Alternatives, federal, state, and county revenues associated with resources within the MCFO are reported in Table 4-81. Federal natural resource related revenues distributed back to state and local governments help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

Average annual natural resource related revenues anticipated to be distributed back to the study area are shown in Table 4-81. While these payments only account for a portion of total natural resource related revenue distributed to counties across the 17-county study area, local rural communities rely heavily on these payments to cover basic operating costs and to fund public schools and roads. Salary and non-salary expenditures funded

with these revenues are estimated to support more than 217 local jobs and $9 million in local wages and income throughout the study area (Tables 4-77 and Table 4-78).

BLM Expenditures: As discussed above under the *Impacts Common to All Alternatives section*, MCFO's salary and non-salary expenditures are anticipated to be about $19.43 million annually ($9.4 million for labor and $10 million for non-labor expenditures). The BLM is anticipated to continue to employ about 47 permanent employees and 31 non-permanent employees to manage the MCFO.

ALTERNATIVE D

Recreation: Investment and improvements to MCFO's recreational resources under Alternative D are anticipated to enable the field office to support a 2-percent increase in annual average visits when compared to future recreational use under current management. Over the next 20 years, MCFO's lands are anticipated to support 138,093 visits on annual average. Recreational experiences supported by BLM-administered lands within the MCFO would continue to contribute to the overall quality of life enjoyed by local residents and attract visitors from outside the study area. Projections for average annual visits under Alternative D include approximately 78,713 local visits and 59,380 non-local visits. Approximately 67 percent of average annual visits to MCFO lands are anticipated to be wildlife related which includes hunting fishing, and wildlife viewing.

As discussed in the existing conditions, these public lands support a wide range of outdoor experiences which contribute to the quality of life and sense of place in many surrounding communities. Outdoor recreation also stimulates economic activity in numerous industrial sectors that support the travel and tourism industry. Opportunities for recreation under Alternative D are estimated to support approximately 78 jobs and $1.96 million in labor income across the 17-county study area. Approximately 57 of the estimated jobs and $1.4 million in local labor income would be supported by non-local recreation (Table 4-77 and Table 4-78).

Livestock Grazing: Alternative D would continue to authorize livestock grazing on BLM-administered lands. Under this alternative, BLM-administered forage would continue to fulfill a seasonal niche and contribute to the financially viability of permittees. Livestock grazing under Alternative D would be slightly restricted to meet recreation objectives. These restrictions are anticipated to result in a 2 AUM reduction in the number of cattle AUMs authorized annually. Under this alternative, permittees would be authorized to use up to 546,506 AUMs annually. The decrease in livestock grazing on BLM-administered lands is not anticipated to significantly affect the region's livestock industry.

In terms of local area contributions from BLM supplied forage, permitted use levels of allotments administered by the MCFO would continue to support 1,039 total jobs and approximately $13.6 million in local labor income (including direct, indirect and induced wages and proprietor's income) on an average annual basis. Public revenues associated with the redistribution of federal grazing fees would support additional employment and income. Under the alternatives grazing associations and individual permit holders would continue to pay federal grazing fees which are anticipated to generate $737,783 in federal revenue. In accordance with federal and state statutes, the 17-county study area is anticipated to receive a total of $130,588 in grazing revenues to fund general government functions, public schools, and roads in the counties where revenue was generated. See the Economics Appendix for more information on how these revenues were calculated.

Ecosystem Restoration and Forest Products**:** MCFO would continue to provide forest products for commercial and personal use under Alternative D. On annual average, 1,100 mbf of softwood sawtimber and 108 posts are anticipated to be harvested within the MCFO. Approximately 90 percent of poles are anticipated to be used for personal use. Under this alternative, the MCFO would increase personal use permits (including Christmas tree and firewood permits) to 60 permits a year. Revenues collected from timber product sales and permits are estimated to generate about $54,000 in federal revenue. Four percent of non-stewardship timber receipts are returned through the state to the counties of origin. Timber management under Alternative D is anticipated to support approximately 8 jobs and $656,000 in total labor income in the local economy (Table 4-77 and Table 4-78).

Mineral Development: Future federal mineral development associated with these public lands under Alternative D would include crude oil, natural gas, coal, and bentonite. Under this alternative, leasing and development of

federal minerals administered by the MCFO are anticipated to increase over the 20 year planning period. Bentonite and coal production are discussed above under the *Impacts Common to All Alternatives* section, anticipated oil, natural gas, and revenues associated with federal leasable minerals are reported in Table 4-80.

Approximately 4.5 million acres of unleased federal minerals administered by the BLM would be available for leasing under alternative D. Under this alternative, annual average federal oil production is anticipated to increase by approximately 7 percent over the current production of 5.59 million barrels. On annual average federal oil production associated with minerals leased from the MCFO are anticipated to reach 5,968,421 bbls per year. Over the next 20 years, 1,641 new wells are anticipated to be drilled on federal mineral leases within the field office. Approximately 16 percent of these wells are anticipated to be dry wells. On annual average, 46 producing oil and gas wells (25 oil wells and 21 conventional gas wells), 27 CBNG wells, and 14 dry wells would be drilled per year. Approximately 95 percent of the production would come from three areas: the Cedar Creek Anticline (Fallon and Wibaux counties), the northeast Williston Basin (Richland and Sheridan counties), and the Powder River Basin (Carter, Powder River, and Rosebud counties). The remainder would occur in the Poplar Dome area (Roosevelt County) and the Porcupine Dome area (Rosebud County).

Federal natural gas production is anticipated to increase by approximately 5 percent over the current production of 7.56 million MCF. On annual average federal natural gas production associated with minerals leased from the MCFO are anticipated to reach 7,975,789 MCFs per year. Two thirds of new production would be from conventional natural gas wells. Approximately 80 percent would occur in the Cedar Creek Anticline (Fallon and Wibaux counties). The remainder would occur in the Poplar Dome area (Roosevelt County), the Porcupine Dome area (Rosebud County), and throughout the planning area. All of the CBNG production would occur in the Powder River Basin in Big Horn, Powder River, and Rosebud counties.

It is estimated that the exploration, development, and production of bentonite, coal, oil, and natural gas administered by the MCFO would support a total of 608 local jobs and an estimated $35.0 million in local labor income on annual average (Table 4-77 and Table 4-78). Annual rents and royalties associated with leasing and production of federal minerals within the MCFO are anticipated to generate more than $99.9 million in public revenue collected by the federal government on annual average over the planning period (Table 4-80). Based on recent bonus bids for leases within the MCFO, one-time bonus bids for new federal mineral lease could generate about $3.8 million in federal revenue annually. In accordance with the statutes discussed in *the Payments to Counties* section of the *Economics Appendix,* a portion of these federal revenues would be distributed back to the State of Montana and to counties affected by the leasing and development of federal minerals leased from the MCFO. It is estimated that leasing and development of MCFO's coal, oil, and natural gas resources would generate approximately $103.7 million in federal revenue with the state receiving $36.5 million and local governments across the 17-county planning area receiving $13.7million of federal revenues on an annual average basis (Table 4-81).

Payments to Counties: Revenue-sharing programs administered by the Bureau of Land Management entitle local governments to a portion of receipts derived from the use, extraction, or sale of natural resources on BLM-administered lands within their jurisdiction; as well as, payments in lieu of taxes (PILT) that would have been received if these federal lands were privately owned. PILT payments are discussed above in the Payments to Counties section under Impacts Common to All Alternatives. Federal, state, and county revenues associated with resources within the MCFO are reported in Table 4-81. Federal natural resource related revenues distributed back to state and local governments help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

Average annual natural resource related revenues anticipated to be distributed back to the study area are shown in Table 4-81. While these payments only account for a portion of total natural resource related revenue distributed to counties across the 17-county study area, local rural communities rely heavily on these payments to cover basic operating costs and to fund public schools and roads. Salary and non-salary expenditures funded with these revenues are estimated to support approximately 217 local jobs and $9 million in local wages and proprietor's income throughout the study area (Tables 4-77 and Table 4-78).

BLM Expenditures: As discussed above under the *Impacts Common to All Alternatives* section, MCFO's salary and non-salary expenditures are anticipated to about $19.43 million annually ($9.4 million for labor and $10 million for non-labor expenditures). The BLM is anticipated to continue to employ about 47 permanent employees and 31 non-permanent employees to manage the MCFO.

ALTERNATIVE E (Proposed)

Recreation: Investment and improvements to MCFO's recreational resources under Alternative E are anticipated to enable the field office to support a 6-percent increase in annual average visits when compared to future recreational use under current management. Over the next 20 years, MCFO's lands are anticipated to support 142,875 visits on annual average. Recreational experiences supported by BLM administered lands within the MCFO would continue to contribute to the overall quality of life enjoyed by local residents and attract visitors from outside the study area. Projections for average annual visits under Alternative E include approximately 81,439 local visits and 61,436 non-local visits. Approximately 67 percent of average annual visits to MCFO lands are anticipated to be wildlife related which includes hunting fishing, and wildlife viewing.

As discussed in the existing conditions, these public lands support a wide range of outdoor experiences which contribute to the quality of life and sense of place in many surrounding communities. Outdoor recreation also stimulates economic activity in numerous industrial sectors that support the travel and tourism industry. Opportunities for recreation under Alternative E are estimated to support approximately 81 jobs and more than $2 million in labor income across the 17-county study area. Approximately 59 of the estimated jobs and $1.4 million in local labor income would be supported by non-local recreation (Table 4-77 and Table 4-78).

Livestock Grazing: Alternative E would continue to authorize livestock grazing on BLM-administered lands. Under this alternative, BLM-administered forage would continue to fulfill a seasonal niche and contribute to the financially viability of permittees. Livestock grazing under Alternative E would be slightly restricted to meet biological and recreation objectives. These restrictions are anticipated to result in a 12 AUM reduction in the number of cattle AUMs authorized annually. Under this alternative, permittees would be authorized to use up to 546,496 AUMs annually. The decreases in livestock grazing on BLM administered lands are not anticipated to significantly affect the region's livestock industry.

In terms of local area contributions from BLM supplied forage, permitted use levels of allotments administered by the MCFO would continue to support 1,039 total jobs and approximately $13.6 million in local labor income (including direct, indirect and induced wages and income) on an average annual basis. Public revenues associated with the redistribution of federal grazing fees would support additional employment and income. Under the alternatives grazing associations and individual permit holders would continue to pay federal grazing fees which are anticipated to generate $737,770 in federal revenue. In accordance with federal and state statutes, the 17-county study area is anticipated to receive a total of $130,585 in grazing revenues to fund general government functions, public schools, and roads in the counties where revenue was generated. See the Economics Appendix for more information on how these revenues were calculated.

Ecosystem Restoration and Forest Products**:** MCFO would continue to provide forest products for commercial and personal use under Alternative E. On annual average, 1,100 mbf of softwood sawtimber and 108 posts are anticipated to be harvested within the MCFO. Approximately 90 percent of poles are anticipated to be used for personal use. Under this alternative, the MCFO would increase personal use permits (including Christmas tree and firewood permits) to 60 permits a year. Revenues collected from timber product sales and permits are estimated to generate about $54,000 in federal revenue. Four percent of non-stewardship timber receipts are returned through the state to the counties of origin. Timber management under Alternative E is anticipated to support approximately 8 jobs and $656,000 in total labor income in the local economy (Table 4-77 and Table 4-78).

Mineral Development: Future federal mineral development associated with these public lands under Alternative E would include crude oil, natural gas, coal, and bentonite. Under this alternative, leasing and development of federal minerals administered by the MCFO are anticipated to increase over the 20 year planning period. Bentonite and coal production are discussed above under the *Effects Common to All Alternatives* section, anticipated oil, natural gas, and revenues associated with federal leasable minerals are reported in Table 4-80.

Approximately 4.5 million acres of unleased federal minerals administered by the BLM would be available for leasing under alternative E. Under this alternative, annual average federal oil production is anticipated to increase by approximately 7 percent over the current production of 5.59 million barrels. On annual average federal oil production associated with minerals leased from the MCFO are anticipated to reach 5,924,211 bbls per year. Over the next 20 years, 1,483 new wells are anticipated to be drilled on federal mineral leases within the field office. Approximately 16 percent of these wells are anticipated to be dry wells. On annual average, 40 producing oil and gas wells (22 oil wells and 18 conventional gas wells), 26 CBNG wells, and 12 dry wells would be drilled per year. Approximately 95 percent of the production would come from three areas: the Cedar Creek Anticline (Fallon and Wibaux counties), the northeast Williston Basin (Richland and Sheridan counties), and the Powder River Basin (Carter, Powder River, and Rosebud counties). The remainder would occur in the Poplar Dome area (Roosevelt County) and the Porcupine Dome area (Rosebud County).

Federal natural gas production is anticipated to increase by approximately 5 percent over the current production of 7.56 million MCF. On annual average federal natural gas production associated with minerals leased from the MCFO are anticipated to reach 7,928,421 MCFs per year. Two thirds of new production would be from conventional natural gas wells. Approximately 80 percent would occur in the Cedar Creek Anticline (Fallon and Wibaux counties). The remainder would occur in the Poplar Dome area (Roosevelt County), the Porcupine Dome area (Rosebud County), and throughout the planning area. All of the CBNG production would occur in the Powder River Basin in Big Horn, Powder River, and Rosebud counties.

It is estimated that the exploration, development, and production of bentonite, coal, oil, and natural gas administered by the MCFO would support a total of 589 local jobs and an estimated $33.2 million in local labor income on annual average (Table 4-77 and Table 4-78). Annual rents and royalties associated with leasing and production of federal minerals within the MCFO are anticipated to generate more than $99.4 million in public revenue collected by the federal government on annual average over the planning period (Table 4-80). Based on recent bonus bids for leases within the MCFO, one-time bonus bids for new federal mineral lease could generate about $3.8 million in federal revenue annually. In accordance with the statutes discussed in *the Payments to Counties* section of the *Economics Appendix,* a portion of these federal revenues would be distributed back to the State of Montana and to counties affected by the leasing and development of federal minerals leased from the MCFO. It is estimated that leasing and development of MCFO's mineral resources would generate approximately $103.2 million of federal revenue with the state receiving $36.3 million and local governments across the 17-county planning area receiving $13.6 million of federal revenues on an annual average basis (Table 4-81).

Payments to Counties: Revenue-sharing programs administered by the Bureau of Land Management entitle local governments to a portion of receipts derived from the use, extraction, or sale of natural resources on BLM administered lands within their jurisdiction; as well as, payments in lieu of taxes (PILT) that would have been received if these federal lands were privately owned. PILT payments are discussed above in the Payments to Counties section under Impacts Common to All Alternatives, federal, state, and county revenues associated with resources within the MCFO are reported in Table 4-81. Federal natural resource related revenues distributed back to state and local governments affected by activities associated with public lands help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

Average annual natural resource related revenues anticipated to be distributed back to the study area are shown in Table 4-81. While these payments only account for a portion of total natural resource related revenue distributed to counties across the 17-county study area, local rural communities rely heavily on these payments to cover basic operating costs and to fund public schools and roads. Salary and non-salary expenditures funded with these revenues are estimated to support approximately 216 local jobs and $9 million in local wages and income throughout the study area (Tables 4-77 and Table 4-78).

BLM Expenditures: As discussed above under the *Impacts Common to All Alternatives* section, MCFO's salary and non-salary expenditures are anticipated to about $19.43 million annually ($9.4 million for labor and

$10 million for non-labor expenditures). The BLM is anticipated to continue to employ about 47 permanent employees and 31 non-permanent employees to manage the MCFO.

CUMULATIVE EFFECTS

Alternative A (No Action)

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor income contributed by BLM-administered land and resource management under Alternative A would be about 2,100 jobs and $100 million in local labor income. The largest employment and labor income impacts would occur in the mining and government industry sectors. Annual average program revenues are anticipated to generate more than $104 million in federal revenue annually over the next 20 years under current management. The redistribution of federal revenues associated with the MCFO is estimated to provide Montana with $36.5 million in public revenue and the 17-county study area with $16.5 million on annual average (Table 4-81). In addition to revenue sharing, for our analyses, it is assumed that counties containing BLM-administered lands managed as part of the MCFO continue to receive PILT payments to offset lower property tax bases because of the tax exemption status of these federal lands. The demographic and economic trends described in Chapter 3 to provide context for impacts would be expected to continue. See the *Economics Appendix* for more information on how employment and income supported by recreation, livestock grazing, costs of ecosystem restoration, and BLM employment and expenditures were estimated.

Alternative B

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor income contributed by BLM-administered land and resource management under Alternative B would be about 2,000 jobs and $95 million in local labor income. The largest employment and labor income impacts would occur in the mining and government industry sectors. Annual average program revenues are anticipated to generate about $102.8million in federal revenue over the next 20 years. The redistribution of federal revenues associated with the MCFO is estimated to provide Montana with $35.9 million in public revenue and the 17-county study area with $16.3 million on annual average (Table 4-81). In addition to revenue sharing, for our analyses, it is assumed that counties containing BLM-administered lands managed as part of the MCFO continue to receive PILT payments to offset lower property tax bases because of the tax exemption status of these federal lands. The demographic and economic trends described in Chapter 3 to provide context for impacts would be expected to continue. See the *Economics Appendix* for more information on how employment and income supported by recreation, livestock grazing, costs of ecosystem restoration, and BLM employment and expenditures were estimated.

Alternative C

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor income contributed by BLM-administered land and resource management under Alternative C would be about 2,100 jobs and $101 million in local labor income. The largest employment and labor income impacts would occur in the mining and government industry sectors. Annual average program revenues are anticipated to generate more than $104 million in federal revenue over the next 20 years. The redistribution of federal revenues associated with the MCFO is estimated to provide Montana with $36.5 million in public revenue and the 17-county study area with $16.5 million on annual average (Table 4-81). In addition to revenue sharing, for our analyses, it is assumed that counties containing BLM-administered lands managed as part of the MCFO continue to receive PILT payments to offset lower property tax bases because of the tax exemption status of these federal lands. The demographic and economic trends described in Chapter 3 to provide context for impacts would be expected to continue. See the *Economics Appendix* for more information on how employment and income supported by recreation, livestock grazing, costs of ecosystem restoration, and BLM employment and expenditures were estimated.

Alternative D

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor income contributed by BLM-administered land and resource management under Alternative D would be about 2,100 jobs and $102 million in local labor income. The largest employment and labor income impacts would occur in the mining and government industry sectors. Annual average program revenues are anticipated to generate about $104.6 million in federal revenue over the next 20 years. The redistribution of federal revenues associated with the MCFO is estimated to provide Montana with $36.5 million in public revenue and the 17-county study area with $16.5 million on annual average (Table 4-81). In addition to revenue sharing, for our analyses, it is assumed that counties containing BLM administered lands managed as part of the MCFO continue to receive PILT payments to offset lower property tax bases because of the tax exemption status of these federal lands. The demographic and economic trends described in Chapter 3 to provide context for impacts would be expected to continue. See the *Economics Appendix* for more information on how employment and income supported by recreation, livestock grazing, costs of ecosystem restoration, and BLM employment and expenditures were estimated.

Alternative E (Proposed)

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor income contributed by BLM-administered land and resource management under Alternative D would be about 2,100 jobs and $100 million in local labor income. The largest employment and labor income impacts would occur in the mining and government industry sectors. Annual average program revenues are anticipated to generate a little more than $104 million in federal revenue over the next 20 years. The redistribution of federal revenues associated with the MCFO is estimated to provide Montana with $36.3 million in public revenue and the 17-county study area with $16.5 million on annual average (Table 4-81). In addition to revenue sharing, for our analyses, it is assumed that counties containing BLM administered lands managed as part of the MCFO continue to receive PILT payments to offset lower property tax bases because of the tax exemption status of these federal lands. The demographic and economic trends described in Chapter 3 to provide context for impacts would be expected to continue. See the *Economics Appendix* for more information on how employment and income supported by recreation, livestock grazing, costs of ecosystem restoration, and BLM employment and expenditures were estimated.

HAZARDOUS MATERIALS AND WASTE

IMPACTS COMMON TO ALL ALTERNATIVES

Under all alternatives, environmental conditions would be protected through hazardous waste or materials management. Any authorized uses would adhere to federal and state requirements to reduce or eliminate impacts. Procedures in place to address unauthorized use and accidental events would help to minimize, to the greatest extent possible, public exposure and environmental impacts.

In terms of health and safety, land use authorizations would not be issued for uses that would involve the disposal or storage of material that would contaminate the land. Lands proposed for acquisition or disposal would need to be inventoried for the presence of hazardous materials. The presence of contaminants would potentially lead to actions such as the modification or abandonment of a land tenure adjustment proposal or remediation (in the form of cleanup and removal of the contaminants).

With increased recreational and commercial use of public surface in the planning area would come risks inherent to increases in the amount of hazardous materials generated, used, transported, and stored. However, no substantial new hazardous materials uses or waste generation would occur within the planning area.

Implementing hazardous materials management activities would address human health and environmental risks from potential hazardous materials release or exposures. Hazardous materials in the planning area would be managed to reduce risks to visitors and employees, to restore contaminated lands, and to carry out emergency response activities, in accordance with appropriate laws, policies, and regulations. An active remediation

program would remain in place under all alternatives. Indirect impacts related to risks from hazardous materials during remediation would exist in the planning area.

Under all alternatives, activities would comply with the requirements of Onshore Order 6 for hydrogen sulfide (H_2S) plans (BLM 1990a). Additionally, any hydrogen sulfide wells would be placed a safe distance from (more than 2 miles), or prohibited within, the vicinity of towns, cities, designated campgrounds, areas of high public use, and frequent recreation sites.