Chapter 4
Environmental Consequences

Introduction

Chapter 4 describes the environmental, economic, and social consequences of implementing the alternatives presented in Chapter 2. The impact analyses and conclusions are based on interdisciplinary team knowledge of resources within the planning area, reviews of existing literature, and information provided by other agencies, institutions, and individuals. Geospatial analysis was conducted using Environmental Systems Research Institute (ESRI) ArcGIS Desktop 9.3 software. Effects are quantified where possible; in the absence of quantitative data, best professional judgment was used. Impacts are sometimes described using ranges of potential impacts or in qualitative terms if appropriate. Since the alternatives, at times, provide general management direction, the analysis may represent best estimates of impacts since specific locations and proposed actions are often unknown at this scale. The analyses are presented here by resource and alternative (Chapter 3 provides a detailed description of each resource).

Chapter 4 is presented in the following sections:

- Introduction
- Critical Elements
- Reasonably Foreseeable Development Scenarios
- Impacts from the Alternatives (including Analysis Assumptions, Impacts Common to All Alternatives, Direct and Indirect Effects, and Cumulative Impacts)
- Unavoidable Adverse Impacts
- Short-Term Use versus Long-Term Productivity
- Irreversible and Irretrievable Commitment of Resources

A table summarizing environmental impacts of the alternatives is presented in Table 2-3 at the end of Chapter 2. It is important to note that some of the impacts from individual alternatives are the same as the impacts described in the impacts Common to All Alternatives section that is presented at the beginning of each resource or resource use section of Chapter 4.

The Introduction (below) includes definitions of the types of effects to be projected throughout the impact sections. The terminology used discusses the availability of data and identifies the BLM's Critical Elements. This section is followed by a description of Reasonably Foreseeable Future Actions and Development scenarios, which form the basis of analysis assumptions for projected development. The impact analysis is then presented by alternative and estimates, in detail, effects of the various management actions by alternative. Since the mitigation measures and standard operating procedures have been included in the alternatives as design features, many potential impacts are reduced or eliminated. Impact analyses and conclusions are based on interdisciplinary team knowledge of the resources and the planning area, information provided by the BLM or other agency experts, and information contained in pertinent literature. The baseline used for the impact analysis is the current condition or situation as described in Chapter 3, Affected Environment.

> ***Readers Note:*** Some of the impacts from individual alternatives are the same as the impacts described in the Impacts Common to All Alternatives section that is presented at the beginning of each resource or resource use section of Chapter 4. In these cases, the impacts are described only in the Impacts Common to All Alternatives section and are not repeated under individual alternatives.

Within each resource section, the Effects Common to All Alternatives section describes impacts that do not vary by alternative. These impacts are not discussed again. Additionally, for any given resource, some management actions will not affect the resource. If a management action is not discussed, it is because the resource analyst determined no impact to that resource would occur.

Separate sections describing unavoidable adverse impacts, short-term use versus long-term productivity, and irreversible and irretrievable commitment of resources are presented at the end of this chapter.

For ease of reading, analysis shown in Alternative A (or any other alternative, if appropriate) may be referenced in discussions of subsequent alternatives with such statements as "impacts would be the same as Alternative A" or "impacts would be the same as Alternative A, except for ..." as applicable.

General Assumptions

Sufficient funding and personnel would be available for implementation of any alternative.

Implementation of all alternatives would be in compliance with all valid existing rights, federal regulations, bureau policies, and other requirements.

Appropriate maintenance would maintain the functional capability of all facilities, range improvements and developments.

Existing structures would not be affected by No Surface Occupancy (NSO) restrictions.

Adaptive management practices would be implemented in a timely manner.

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.

The RMP/EIS is based on data that is available at the time of development. As additional locations of resource features such as leks, nests, cultural sites, etc. are discovered, the management action associated with the feature would apply according to the selected alternative unless changed through an RMP amendment.

The analysis of effects of the alternatives is required by BLM planning regulations and is consistent with the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA). The analysis presents best estimates of impacts and, as required by NEPA, direct, indirect, and cumulative effects are discussed. When quantitative information is available, impacts are calculated primarily through geographic information system (GIS) applications. All quantitative information is approximate and may be subject to further refinement when considered at finer scales.

The criteria for identification of resources or resource attributes is based on the best available information that is available in a format that can be used with existing models or computer programs. As the Final RMP/EIS is finished and implemented, the extent or distribution of resources or resource attributes may change from what is determined in the Draft RMP/EIS as new information becomes available or improved methods of processing/analyzing information are developed. Prior to implementing restrictions or stipulations, field verification of individual project sites would be required to confirm that a particular resource or resource attribute such as sensitive soils, floodplains, riparian areas, etc. are present and a stipulation or restriction is applicable to the project and the values that are being protected.

Generally, the alternatives describe an overall management framework rather than site-specific locations for activities. Therefore, environmental consequences are most often expressed in general, comparative terms. Impacts are quantified with available data to the extent practical. In the absence of quantitative data, best professional judgment provides the basis for the impact analysis. Impact analyses and conclusions are based on interdisciplinary team knowledge of the resources and the planning area, information provided by experts in the BLM or other agencies, and information contained in pertinent existing literature.

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) (refer to Appendix B), including those specific Mitigation Measures and Conservation Actions for Greater Sage-Grouse (refer to Appendix V). For analysis purposes, it has been assumed that these practices and conservation actions would be implemented during site-specific project planning where appropriate. For a detailed explanation of BMPs and Guidelines, see the BMP and Guidelines section of Chapter 2.

To help guide the determination of effects, each resource analyst developed analysis assumptions, which are described in the beginning of each resource section.

Types of Effects

Direct, indirect, and cumulative impacts are considered in this effects analysis, consistent with direction provided in 40 CFR 1502.16. Direct impacts are caused by an action or implementation of an alternative and occur at the same time and place. Indirect impacts result from implementation of an action or alternative, are reasonably certain to occur, and usually occur later in time or removed in distance. Cumulative impacts result from activities combined with past, present, and future actions on all jurisdictions. Cumulative impacts also result from individually minor but collectively significant actions over time.

Actions anticipated over the next 20 years on all lands in the planning area, including private, state and federal ownerships have been considered in this analysis to the extent reasonable and possible.

Analysis Terminology

The following definitions are used in the alternatives analysis.

Scope of the Analysis

Impacts descriptions are limited to the temporal and geographic scope described below, unless otherwise defined in the individual resource sections.

- Temporal Scope
  - *Short-term* – effects lasting less than 5 years
  - *Mid-term* – effects lasting 5-10 years
  - *Long-term* – effects lasting more than 10 years
- Irretrievable Commitment of Resources: results from actions where resources are considered permanently lost.
- Irreversible Commitment of Resources: results from actions where resources are considered permanently changed.
- Geographic Scope
  - *Decision Area* – refers to lands in the planning where the BLM has authority to make land use and management decisions. This includes split estate lands where the federal government has retained subsurface minerals.
  - *Analysis Area* – refers to those lands within the area to be analyzed. The analysis area is the decision area, unless otherwise defined in the individual resource sections.
  - *Planning Area* – refers to all land within the South Dakota Field Office (SDFO) administrative boundary regardless of ownership or jurisdiction.
  - *Negligible* – an effect at the lower level of detection; change would not be measurable. Effects may not be readily noticeable.
  - *Low or Minor* – an effect is slight but detectable; change would be small.
  - *Medium or Moderate* – an effect is readily apparent; change would be measurable.
  - *High or Major* – an effect is severe; change would be highly noticeable/measurable.
  - *Unavoidable Adverse Effects* – those effects that remain following the implementation of mitigation measures or effects for which there are no mitigation measures.
  - *Beneficial or Positive* – an effect promoting a favorable result for a specific resource or resource use. This term could be used in short-term, long-term, or both short- and long-term contexts.
  - *Adverse or Negative* – an effect that is detrimental or causes harm to a specific resource or resource use. This term could be used in short-term, mid-term, long-term, or all three contexts.
  - *Neutral* – an effect that is neither beneficial nor adverse to a specific resource or resource use.

How the Summaries of Acres Apply (GIS analysis)

Acreages affected by restrictions are approximations based on GIS analysis. The acreages represent a single restriction's areal (area) extent. There may be areas where multiple restrictions overlap. In instances where there is overlap, the most restrictive type of restriction would be employed to ensure proper resource protection. The areal extent affected by a management action may change through the life of the RMP based on new knowledge obtained on resources, new refinements in definitions, as well as new applications of technology. These changes would normally be documented during RMP maintenance.

Unless otherwise noted, acres listed as BLM surface estate includes the BLM-managed surface estate acres regardless of subsurface (mineral) ownership. Acres listed as subsurface include BLM-administered federal mineral estate regardless of surface ownership.

In some cases the BLM-administered mineral estate (subsurface) acres protecting the same area may be different for each mineral type because the federal government may own only certain portions of the mineral rights. For example, on a section of land the federal government may have the oil and gas mineral rights, but not the salable mineral rights. The manner in which the federal government maintained or relinquished all or portions of mineral rights when federal lands were privatized is complex and has varied during different time periods. In other cases, apparent inconsistencies in the acres that are listed may occur because of cases where there is no federal mineral estate underneath BLM-administered surface estate. This usually occurs when private lands are transferred back to the federal government and the previous owner kept all or part of the mineral rights.

Available Data and Incomplete Information

The best available information pertinent to the decisions to be made was used in development of the RMP/EIS. Considerable effort was put forth to acquire and convert resource data into digital format for use in the plan; both from BLM sources and from outside sources such as the State of South Dakota. Certain information was unavailable for use, usually because inventories have either not been conducted, were not complete, or were not of consistent quality across the planning area. As necessary, resource specialists have indicated within resource sections where data is incomplete or substantially lacking. In these instances, impacts cannot be quantified given the proposed management of certain resources. Where this occurs, impacts are projected in qualitative terms, or in some instances, are described as unknown. Subsequent project level analysis would provide the opportunity to collect and examine site-specific inventory data necessary to determine the appropriate application of the RMP level guidance. In addition, ongoing inventory efforts within the planning area continue to update and refine the information used to implement this RMP/EIS.

Critical Elements

The BLM considers 14 items as "Critical Elements of the Human Environment" that must be addressed during environmental analysis. Critical Elements include:

- Air Quality
- Areas of Critical Environmental Concern
- Cultural Resources
- Environmental Justice
- Floodplains
- Native American Religious Concerns (addressed under Cultural)
- Prime and Unique Farmlands
- Threatened or Endangered Species (addressed under Special Status Species)
- Hazardous or Solid Wastes
- Water Quality
- Wetlands/Riparian Zones (addressed under Vegetative Communities – Riparian and Wetlands)
- Wild and Scenic Rivers
- Wilderness and lands with wilderness characteristics
- Noxious Weeds and Non-Native Invasive Plants (addressed under Invasive Species).

Currently, no Wilderness and no Wild and Scenic Rivers (WSRs) are designated in the planning area; therefore, no existing Wilderness areas or WSRs are addressed in this RMP/EIS. Proposed designations, however, are addressed by alternative.

Large floodplains and Prime or Unique Farmlands are generally not present on BLM-administered lands in the planning area. Where they may occur, subsequent project level analysis for any projects with potential to impact floodplains or Prime or Unique Farmlands would be prepared to address potential impacts.

The remaining 11 critical elements are addressed under the pertinent sections of Chapter 4.

Reasonably Foreseeable Development Scenarios

A number of assumptions were made to facilitate the analysis of the alternative management actions. These assumptions set guidelines for analysis and provide reasonably foreseeable levels of development that would occur within the planning area over the analysis period (20 years). These assumptions and reasonably foreseeable development (RFD) scenarios should not be interpreted as constraining or redefining the management objectives and actions proposed for each alternative and described in Chapter 2. RFD scenarios are set forth below. Assumptions are included in each resource section in this chapter. If no assumptions are included in a resource section, it is because no assumptions were made.

Uranium Potential

There has been a recent resurgence of interest in uranium mining operations nationwide, due to uranium stockpiles becoming depleted, and the price of uranium rising significantly. Uranium is primarily used for energy production in nuclear power reactors. Sandstone hosted, roll front type uranium deposits leached from ash containing uranium from past volcanic events are contained in the Lakota and Fall River formations of the Inyan Kara Group adjacent to the Black Hills of South Dakota, as well as in nearby states. Smaller uranium deposits in younger Tertiary lignite coals also exist on some of the buttes and plateaus in northwestern South Dakota. Some mining of these deposits was done in the 1950s. Much of the new mining interest, however, involves in-situ recovery (ISR) methods.

Neutron Energy has shown interest in conventional mining north and northeast of Edgemont, South Dakota. Powertech (USA) Inc. is showing similar interest in South Dakota and Wyoming, and Bayswater Uranium Corporation in Montana is exploring and/or developing deposits to possibly undertake ISR operations to remove uranium ore. In-situ recovery involves pumping a liquid solution into the target ore body to make uranium soluble. More liquid is removed from the ore body than is pumped into it to ensure the liquid moves toward the extraction well. Monitoring wells are used to test for loss of mining solution from the target ore body zone. Once the uranium is dissolved, the solution is pumped to the surface where the uranium is extracted. The liquid solution is then pumped back into the uranium-containing geologic formation to dissolve more uranium in a continuous process.

The proposed Powertech operation located southwest of the Black Hills near Edgemont is the most advanced project. Powertech recently explored areas in South Dakota with drilling projects, and since then has submitted a Plan of Operations to the SDFO. ISR wells would be drilled to go through 500 to 800 feet to the Inyan Kara Group in that area. This project is primarily on private surface with private minerals. According to the company, their project consists of 10,580 acres of leased and purchased land and minerals (6,120 acres) and unpatented mining claims (4,220 acres under the Stock Raising Homestead Act [1916] and 240 acres under BLM surface) near Dewey and Burdock, South Dakota. The company goal would be to produce 1,000,000 pounds of uranium oxide annually for seven years. Production may be extended to 20 years with expanded development. Total disturbance during any one time on the project would be between 108 to 463 acres. BLM land expected to be disturbed would total 14.2 acres.

Following the Dewey-Burdock in-situ operation, Powertech is likely to look next at developing well explored (with drill holes) in-situ prospects in Wyoming west of the Dewey-Burdock area and in-situ prospects in the Aladdin, Wyoming area. Approaching the end of the 20 year life of the plan, Powertech may develop in-situ prospects in the Plum Creek area southeast of Edgemont, South Dakota. However, this is more likely to take place in 30 years (personal communication, Powertech 2010).

Neutron Energy has prospects north and northeast of Edgemont. These uranium deposits are above the water table and would likely be mined using conventional surface mines or underground mines. For these prospects to be viable uranium prices would likely need to be much higher over an extended period of time.

The current Powertech proposal is well explored; however, to develop future projects, short- and long-term exploratory drilling is likely to occur. Drilling would be conducted by drill rigs mounted on trucks similar to those used to drill water wells. Support equipment would include a water truck, electric (geophysical) logging vehicle, and crew support vehicle (pickup truck). Recent drill holes have been between 500 and 800 feet deep, but could range from 500 to 2,000 feet deep. To drill holes on the deeper end of this range, access roads or mud pits to accommodate drilling fluids may be required. The number of exploratory sites to be drilled is currently unknown; however, hundreds could be necessary for such a project.

During the 20 year life of the RMP and the possible fluctuations in prices during that time period, it is possible that other proposals to mine uranium in South Dakota by in-situ recovery methods would be formulated along with a great increase in uranium prices. Such proposals most likely would be in the vicinity of the southern Black Hills ranging from surface exposures of the Inyan Kara Group to lands where the Inyan Kara is no deeper than 2,000 feet (personal communication, Powertech). It is also possible that other ore bodies may be found in the Inyan Kara which could be in-situ mined anyplace in the area adjacent to the Black Hills. Given the pattern of BLM-administered surface ownership and the current understanding of uranium deposits (Figure 3-19), the chance of impacting small quantities of BLM-managed surface over federal minerals north of the Black Hills would be minimal. A moderate chance would exist of impacting a small amount of BLM-managed surface over federal minerals south of the Black Hills. It is very unlikely that BLM surface over federal minerals would be impacted east of the Black Hills. It is difficult to project a scenario that would involve expanded in-situ uranium mining. A large increase in the price of uranium would likely be necessary for more projects to be proposed for South Dakota, and prices would likely need to remain stable for any future project to come to fruition.

In the long term, in-situ facilities for uranium extraction may need to be constructed for each new company project. The use of some ISR facilities for more than one project under a contract basis would likely be considered. Since the deposits are relatively deep (500 to 2,000 feet), if they were to be developed, it is likely that the ISR method of removing the ore would be employed. It is also assumed that the ISR facilities would be from 2,500 to 16,000 acres in size, which is the range identified in the Nuclear Regulatory Commission (NRC) Environmental Impact Statement for In-situ Uranium Leach Milling Facilities (Final Report, May 2009).

As the principle federal licensing agency, the NRC evaluated the impacts associated with construction and operation of an in-situ uranium recovery operation in the EIS. The document provides a good description of a generic ISR operation as well as the impacts associated with such a development. An excerpt follows:

> "A commercial in-situ ISR facility consists of both underground and surface infrastructure. The underground infrastructure includes injection and production wells drilled to the uranium mineralization zone, monitoring wells drilled to the surrounding ore body aquifer and to the adjacent overlying and underlying aquifers, and perhaps deep injection wells to dispose of liquid wastes. ISR facilities in the uranium milling regions considered in this GEIS (i.e., Wyoming West, Wyoming East, Nebraska-South Dakota-Wyoming, and Northwestern New Mexico) are commonly exposed to freezing conditions during winter months. Therefore, pipelines to transfer groundwater extracted from the well fields to the uranium processing circuit are buried to avoid freezing and thus are considered to be part of the underground infrastructure.
>
> ISR facilities also include surface infrastructure that supports uranium processing. The surface facilities can include a central uranium processing facility, header houses to control flow to and from the well fields, satellite facilities that house ion-exchange columns and reverse osmosis equipment for groundwater restoration, and ancillary buildings that house administrative and support personnel. Surface impoundments such as solar evaporation ponds may be constructed to manage liquid effluents from the central processing plant and the groundwater restoration via treatment and recirculation of water through the same system used for production. The purpose of treatment and recirculation is to return the formation chemistry to a reduced condition, once again making any remaining uranium insoluble.
>
> The surface extent of a full-scale (i.e., commercial) ISR facility includes a central processing facility and supporting surface infrastructure for one or more well fields (sometimes called mine units) and

> encompasses about 1,000 to 6,000 ha [2,500 to 16,000 acres] (NRC, 1992, 1997a). However, the total amount of land disturbed by such infrastructure and ongoing activities at any one time is much smaller, and only a small portion around surface facilities is fenced to limit access. Well fields typically are not enclosed by fencing.
>
> NRC establishes the total flow rates and the maximum amount of uranium that can be produced annually at a commercial ISR facility using license conditions. NRC-licensed flow rates typically range from about 15,100 to 34,000 L/min [4,000 to 9,000 gal/min], and licensed maximum limits on annual uranium production range from about 860,000 to 2.5 million kg/yr [1.9 million to 5.5 million lb/yr] of yellowcake (NRC, 1995, 1998a, b, 2006, 2007). Actual production rates are generally somewhat lower than these limits (Energy Information Administration, 2008)."

The document cited above includes a detailed explanation of the ISR process and associated impacts. It can be found at the following website: http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/v1/intro-ch1.pdf.

Gold Potential

Wharf Resources (USA) Inc. (Wharf) is contemplating migration of their mining operations into parts of the Exemption Area (see Glossary and Figure 2-3). Mining operations could extend into Section 1 and the northern portion of Section 2 (federal surface in Section 2 is administered by the USFS) of T. 4 N., R. 2 E., the northeastern portion of Section 12 of T. 4 N., R. 2 E., the southwestern portion of Section 6 and northwestern portion of Section 7 in T. 4 N., R. 3 E., and the southern portions of Sections 35 and 36 (federal surface in Section 35 is administered by the USFS) of T. 5 N., R. 2 E., BHM, Lawrence County, SD. Most of the small parcels of BLM-administered surface and minerals in Sections 1 and 12 were sold to Wharf within the past decade. Some small BLM-managed parcels remain in the referenced sections. Wharf has reportedly determined that the largest piece of BLM-administered land (between 40 and 50 acres in the northeast quarter of Section 1) contains no gold.

Despite the recent high price of gold, interest in developing new gold mines on BLM-administered surface and minerals is not being expressed. It is possible that interest has been affected by the bankrupt Gilt Edge Mine becoming a Superfund Site due to acid mine drainage containing heavy metals. Companies may be anticipating new requirements to avoid creating environmental problems and high bond levels. Such requirements tend to make gold mining less attractive. Some gold mining interest and investment is currently focused on other countries where the highest deposit grades have not been mined out and where the regulatory environment is not as strict. Continued high gold prices over an extended period of time could make new mining development in the Black Hills more attractive despite environmental restrictions and high bond requirements.

Hobby-related gold prospecting and interest in filing mining claims continues to grow. However, it would likely wane as gold prices decrease.

Cement Grade Limestone Potential

GCC Dacotah Cement will begin mining on a project southwest of the Black Hills in the Dewey area 15 years into the RMP/EIS (USDI, BLM 2009b). GCC Dacotah Cement's mining is not projected to reach any BLM surface and federal minerals until 30 years after the RMP/EIS goes into effect, which is 10 years beyond the expected life of this planning document. The cement grade limestone will be trucked or moved by conveyor belt to the rail line and lastly, moved by train to GCC Dacotah Cement's existing plant on the outskirts of Rapid City.

Bentonite Mining

Within the last 10 years, the SDFO received two proposals for large-scale bentonite mining operations. Bentonite is an important industrial mineral used for a variety of purposes including well drilling, pelletizing aids, waterproofing panels, flocculants, grout, and a host of other uses. Demand for bentonite is presently high and is likely to remain high to moderate over the next 15 to 20 years. The majority of large bentonite deposits within the planning area are located in Butte County. Map 2-13 displays polygons with a 1/2 mile buffer around bentonite claims, and Table 4-1 displays acreage that could be affected by development of two additional mines.

American Colloid Company (ACC) currently has five permits to mine bentonite on 7,447 acres of land under various ownerships in South Dakota. A review of existing data supplied by ACC revealed that 17 percent of the land surface within the project area of existing mines is BLM-administered surface acreage. It is important to note that not all lands permitted as a bentonite mine would actually be mined or disturbed. Only lands specifically suited for mining or mine-related purposes are allowed to be disturbed. Data from past activities indicates that 934 acres (13 percent) of the total 7,447 acres permitted to ACC have been disturbed (SDFO Environmental Assessment MTCO040-0021 2008). The maximum amount of mining and associated disturbance around the mine area is estimated to not exceed 30 percent of the project area.

Table 4-1
Bentonite RFD Acreages

Permitted across all Land Ownership	***BLM Minerals (76% of total acres)***	***Mined BLM Minerals (assuming 30% of project area is mined).***	***Mined on Lands of All Ownership (assuming 30% of project area is actually mined)***	***BLM Surface Ownership in Project Area (assuming 17% of 1,700 acres)***	***BLM Surface Acres Mined (assuming 30% of BLM land in project area is mined)***
1,700	1,292	388	510	289	87

The following RFD scenario is based on past information combined with professional judgment. It is estimated that two bentonite mine projects would be permitted in Butte County, South Dakota. Total permitted acreage would be for two 850 acre mines for a total of 1,700 acres.

All mining activities would occur in the general sagebrush habitat area. The maximum amount of surface acres mined at any given time would not exceed 100 acres. The maximum amount of land not reclaimed to seeding stage would not exceed 100 acres at any given time.

As mining takes place, all mine sites would be contemporaneously reclaimed and seeded with native species. Slopes would be contoured to blend in with the topography to the extent possible. Top soil would be stored and placed back on top of mined areas. Disturbed sites would be reclaimed through the seeding stage within two to five years, and all disturbed sites would be fully reclaimed and released from bond within six to ten years. Mining would be active on the site about 30 days a year over a 10 year period. Reclaimed mine sites would have adequate perennial vegetation to stabilize the site within two growing seasons. It would take five to ten years for herbaceous vegetation to reach equilibrium with surrounding vegetation. Sagebrush would take 20 to 30 years to re-establish itself to a level similar to pre-disturbance conditions.

Drainages within the project area are intermittent drainages with little or no riparian potential. Recontouring of mine sites would be designed to reduce overland flow of bare areas and limit sheet, rill, and gully erosion.

Other Locatable Minerals

While silver is present in the Black Hills, there are no active or proposed mines exclusively for silver. The potential for a mine specifically focused on silver mining is very low; however, it is likely that silver will continue to be extracted at existing gold mines as a side product.

Some examples of other types of minerals that have been mined in the Black Hills and surrounding area include tungsten, tin, zinc, mica, cement grade limestone, uranium and lead. With the exception of cement grade limestone and uranium, no proposals or expressions of interest in the mining of these minerals on BLM-administered land has been received in the last 10 years. Manganese is present in the Pierre Shale formation in the middle of the state but the high cost of separation makes it cost prohibitive to mine.

Rare Earth Elements

Rare earth elements are a group of seventeen chemical elements that occur together in the periodic table. The group consists of yttrium and the 15 lanthanide elements (lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium). Scandium is

found in most rare earth element deposits and is sometimes classified as a rare earth element http://geology.com/articles/rare-earth-elements/ accessed 1/25/13). Some of these elements occur in vein deposits in the tertiary intrusive and Paleozoic rocks. The increase in use of electronics and batteries has increased demand for rare earth minerals in the past 20 years.

A recent proposal to mine rare earth minerals is under review about 30 miles west of the western edge of the planning area in the Bear Lodge Ranger District of the Black Hills National Forest. The veins in which these elements occur in the Black Hills are located mostly in the Bear Lodge District of Wyoming just north of Sundance, although other areas such as the Tinton-Mineral Hill area near the South Dakota/Wyoming border may contain geology consistent with the presence of rare earth minerals (http://bhminerals.sdsmt.edu/directory_minerals.htm accessed 1/25/13) These areas are outside of the decision space of this RMP. While rare earth minerals may be present in other portions of the Black Hills, there are currently no proposals or expressions of interest to mine rare earth elements on federal minerals within the decision space of this RMP.

Oil and Gas

Assumptions

A baseline RFD scenario was prepared prior to undertaking alternatives formulation. The RFD scenario details the most likely amount of development in the planning area over the next 20 years (2010-2029) (USDI, BLM 2009c) (http://www.blm.gov/mt/st/en/fo/south_dakota_field/rmp/rfd.html).

Each proposed protective measure can affect oil and gas development activities by not allowing leasing, restricting surface occupancy, controlling surface use, controlling the time of access, or adding restrictive mitigation to conditions of approval on federal applications for permit to drill. The result is an RFD by alternative that uses the proposed restrictions to calculate a percent reduction in total well numbers and total surface disturbance.

After the proposed wells/surface disturbance per alternative has been quantified, the information can be used to estimate the potential impact that fluid mineral development may have upon different resources. From a resource perspective, well disturbances (versus well numbers) are an indicator of human presence and are considered a disruptive activity.

In addition to the number of oil and gas wells and the surface disturbance, the location of the predicted oil and gas activity is also important to impact analysis for other resources. Most future development is projected to occur in areas that are already experiencing oil and gas development.

Many different circumstances could increase or decrease the level of drilling activity and associated surface disturbance acreage throughout the life of the RMP. If the projections in the RFD prove to be grossly inaccurate, the BLM may at some point apprise the RFD to determine if a plan amendment or revision is necessary.

The RFD scenario that was prepared for the South Dakota RMP reviewed and analyzed past, present, and potential future exploratory, development, and production operations and activities. The RFD projections are reasonable and science-based projections of the anticipated oil and gas activity. Certain lands within the planning area were not assessed for the potential for RFD. Lands within legislatively imposed restrictions (no leasing) are not included in the assessment since oil and gas activities would not be allowed on those lands. Such lands include units of the National Park Service, for instance.

Planning decisions in the planning area also apply to BLM-administered federal minerals that underlie non-federal lands (split estate). Reasonable measures would be required by the Authorized Officer to minimize adverse impacts to other resource values, land uses, or uses not addressed in the lease stipulations at the time operations are proposed. Reasonable measures could include modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. These modifications might occur only through site-specific post lease actions, most likely during the application for permit to drill (APD) process, which are supported by on-site conditions and project-specific NEPA analysis. Modification and/or waivers to lease terms and stipulations can be accomplished in accordance with applicable regulatory guidelines.

In the absence of quantitative data, best professional judgment was used.

For the baseline projection, oil and gas resources in the planning area were analyzed, types of future development that may occur were discussed, development potential for each type of resource was estimated, and baseline activity levels for the period 2008 through 2029 were projected. For analysis of the baseline projection, it was assumed that the only land use restrictions on future oil and gas resource development would be those that have been legislatively imposed. Projections of future well numbers, oil and gas production, and surface disturbance were also prepared.

Projected Oil and Gas Drilling Activity

For a baseline unconstrained RFD projection, it is estimated that during the 20-year planning cycle (2010 to 2029), as many as 524 wells could be drilled in the RFD Study Area. Up to 75 of these wells could be coalbed gas wells (to be discussed later). Of the 449 remaining wells, 359 wells are projected in and around established fields in the southern Williston Basin (Harding and Butte counties) and 40 in and around similarly established fields in Fall River County in the eastern Powder River Basin. An estimated 94 of the 449 drilled oil and gas wells would be located on BLM-managed oil and gas minerals, and as many as 4 of the 75 coalbed gas wells would be located on BLM-managed oil and gas minerals. The estimated development potential, including acres, number of townships, projected average drilling densities, and percentage of lands in the planning area within each development potential classification type are shown in Figure 4-1 and summarized in Table 4-2.

Development potential is defined as high, moderate, low, very low, and none. High development potential indicates areas where estimated average drilling density will be 10 to 29 well locations per township (one township is about 36 square miles) during 2010-2029. Moderate potential indicates 2 to 10 wells per township; low potential indicates 1 to 2 well locations per township; and very low is defined as less than one well location per township. A very high category (more than 30 wells per township) was presented to the oil and gas companies approached for input, but none of these companies indicated they anticipate such development to occur, and based on this and historical drilling trends, the very high category was deemed to have no potential and left out of any projections. Badlands National Park, Wind Cave National Park, Mount Rushmore National Memorial, and Jewel Cave National Monument were not assessed for the potential for future development.

Table 4-2
Oil and Gas Development Potential in the RFD Scenario

Development Potential	*Total Acres in RFD Study Area (all ownerships)*	*Acres of BLM Administered Federal Minerals*	*Number of Townships*	*Percent of RFD Study Area (all ownerships)*
High	318,000	113,473	13.81	1.24
Moderate	476,000	80,459	20.65	1.86
Low	1,082,000	284,555	46.95	4.23
Very Low	22,068,000	1,138,091	957.82	86.33
None	1,617,000	54,162	70.20	6.33

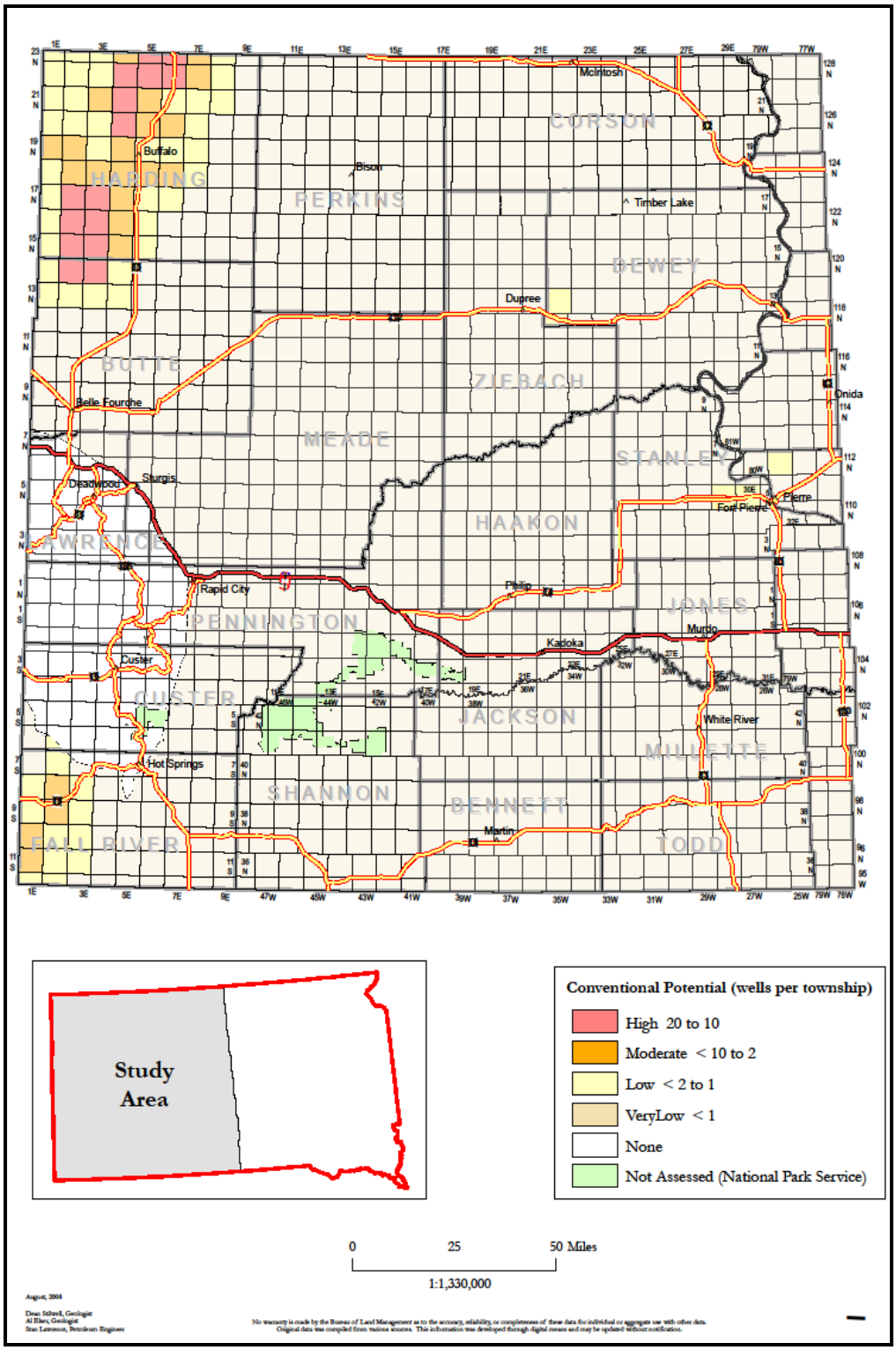
Much of the anticipated drilling activity would be concentrated in areas of high and moderate development potential, which account for only 3.1 percent of the area where development potential was assessed. The high rate of drilling activity in the high RFD category areas is shown in Table 4-3.

Table 4-3
Density of Oil and Gas Wells by Development Potential Category in RFD Study Area (all ownerships)

RFD Scenario Development Potential	*Acres per Well*	*Number of Wells per Township*	*Median Number of Wells per Township*
High	1,178	10 to 29	19.5
Moderate	2,356	2 to 10	6
Low	11,780	1 to 2	1.5
Very Low	23,560	<1	1
None	N/A	0	0

< = less than
N/A = not applicable

Figure 4-1
Oil and Gas (excluding coalbed natural gas) Development Potential in the RFD Study Area
2010 through 2029



Many of the townships marked as high development potential are already densely drilled. Many new wells in these townships would likely be drilled as infill or fringe wells, or as re-entries into existing well bores. Wells in townships with moderate potential would likely be drilled as fringe wells in existing fields or wildcat wells looking to discover entirely new fields. With additional wells projected, density of wells in these areas would generally average one well per 160 acres by 2029. A few of these townships may have oil and gas "sweet spots," where wells would be more closely spaced.

In townships with low development potential, very few new wells would be drilled. Well densities would remain similar to what they are now, with isolated townships having a low potential for increased drilling density, most likely around the fringes of townships with moderate potential. In townships with very low development potential, anticipated activity would be tied to exploration for new biogenic gas field discoveries, and in most townships no drilling would occur. Biogenic gas is gas produced at shallow depths and low temperatures by anaerobic bacterial decomposition of sedimentary organic matter, as opposed to thermal or heat based breakdown of organic matter into oil and gas, which is the source of most oil and gas. If a new field is discovered in any of the areas with very low development potential, subsequent drilling density could increase moderately. However, predicting well density is not possible at this time due to the limited understanding of biogenic gas accumulation potential in the planning area. Based on previous biogenic gas exploration in the planning area, the probability of successful discovery of one or more new biogenic gas fields in these very low development potential areas is likely to be low to very low. Similarly, the probability of a successful oil or conventional gas field discovery in these areas is also considered to be very low.

There are several townships in Dewey, Stanley, and Hughes counties marked as low potential. These townships each have one issued but undrilled drilling permit and, as such, exceed the very low potential category. Based on historical data and reasonable geologic expectations of these areas, ranking these townships above the low potential is not warranted. The only areas regarded as having no development potential are lands where the igneous complexes of the Black Hills are found at or near the surface, and petroleum resources are not expected to have accumulated.

Average well depths are anticipated to remain in the present range with some minor depth increases if deeper reservoirs are encountered locally. Deep wells, greater than 15,000 feet deep, are not anticipated. A few wells greater than 10,000 feet deep could be drilled to the Red River Formation in Harding County or deeper formations if such pools are discovered.

Drilling success rates would remain similar to those for the past 20 years, and about 60 percent of all wells drilled would be successful (oil, gas, or injection wells). Success rates would vary by area with infill wells being more successful (90 percent or greater), and wildcat wells being only about 30 percent successful. A majority of the anticipated activity would be additional drilling to grow identified reserves. Initial estimates of the size of new oil or gas fields are usually too low and over time, newer estimates of the size and ultimate recovery contribute to reserve growth. Factors that contribute to reserve growth include: physical expansion of fields by areal extensions and development of new producing intervals; improved recovery resulting from application of new technology and engineering methods; and upward revisions of reserve calculations based on production experience and changing relations between price and cost.

Projected Coalbed Gas Drilling

The U.S. Geological Survey Coal Map of North America identifies an area underlain by Cretaceous and Tertiary coalbeds in the Williston Basin, which includes a portion of the planning area (U.S. Geological Survey, 2001a and 2001b). However, no quantitative assessment of potential coalbed natural gas resources in this area has been performed. No coalbed natural gas production or exploration activities are presently occurring in the planning area, and the potential for coalbed gas in the Williston Basin portion of the Study Area does not appear to be as large as in neighboring North Dakota.

The strata where coal occurs in the planning area generally lie at depths too deep to be mined economically with today's technology, and hence are potential candidates for coalbed gas exploration. Most of the coals in the planning area lie within what is known as the Fort Union coal region. The Fort Union coals are actually Tertiary-aged lignites. None of the coals in the area are especially thick (generally less than 10 feet); however, an estimated 0.5 trillion cubic feet of potential recoverable coalbed gas resources are in the Fort Union coal region. Based on surface acreage calculations, as much as 10 percent of the gas in these strata may lie within the planning area. The Fort Union coal region's southern extent lies within Butte, Meade, and Ziebach counties of South Dakota (Figure 3-17), and extends north of the planning area covering much of the Williston Basin. Additional coals (Black Hills coal region) are also known to occur in two localized areas within Fall River County; however, each area is only a few sections in aerial extent.

As stated earlier, approximately 75 new coalbed gas wells are projected to be drilled between 2010 and 2029. Areas of known coal strata within the Fort Union region, and the two above-mentioned areas in Fall River County, were assigned low potential. The rest of the assessed planning area was assigned no development potential for the planning period. The National Park Service has no lands within these areas of low potential.

Since no drilling for coalbed gas has yet occurred in the planning area, the economical production is only considered hypothetical at present. No proposed coalbed gas activities have been proposed by industry, and operators have not submitted projections for or interest in future activity.

In order to assess potential impacts of some exploration and potential development of the coalbed gas resource in the planning area, it is assumed that up to 75 new wells could be drilled. Results from coalbed gas pilot drilling projects in Wyoming suggest that often too few wells have been drilled to adequately evaluate the economic viability of a particular area. Past history indicates that pilots should contain 16 wells (four interior) to 25 wells (nine interior) to adequately evaluate an area. History suggests that fewer than 16 to 25 wells may not adequately reduce pressure and allow gas production over a sufficient area. Also, heterogeneity in the coal may preclude the one interior well in a normal five or nine well pilot from providing the data necessary to adequately evaluate economic viability. It is assumed, therefore, that any coalbed gas pilots in the planning area would contain 16 to 25 wells. This should provide a better chance of obtaining adequate data and thus avoiding duplicate projects.

A projection of 75 new coalbed gas wells would allow some exploration activity and preliminary development if a newly discovered resource is determined to be economically viable to produce. Any exploration would most likely occur in the final 10 years of the planning period. An equal potential distribution throughout the Fort Union coal region (Figure 3-17, Chapter 3) is assumed, however much of the potential coalbed gas drilling is likely to only occur in one or two townships, not spread evenly over the area of potential.

Estimated Future Oil and Gas Production

As indicated above, a projected 449 wells (excluding coalbed gas wells) would be drilled within the planning period (2010 through 2029). The RFD assumed that 24 wells would be drilled each year in 2008 and 2009. A table projecting wells spud by year, for the 2010 through 2029 period, was calculated along with a confidence interval of values (South Dakota Final RFD Table 5). These values were determined by using a computer program that was written to statistically analyze available historical drilling and production data constrained by oil and gas futures prices and projected drilling activities (449 new wells in 20 years) to generate the values in the projection tables below. Although Table 4-4 (from the Final South Dakota RFD) projects a range of new wells that could be drilled each year, the mean value projected should be considered the most likely scenario for new drilling in any one year and cumulatively for the 20-year period. As stated earlier, if coalbed gas drilling does occur that activity is expected to only come about toward the end of the 20-year assessment period and drilling will be in groups of 16 to 25 wells.

Hydrocarbon production forecasts for 20 years beyond 2009 are shown in the South Dakota Final RFD Table 6, illustrating that both gas and oil production would increase during this time. The cumulative values listed are just for the 2010 through 2029 projection period and ignore historical production. Of the 39,988,736 barrels of cumulative oil production, about 8,374,185 barrels are projected to come from BLM-managed oil and gas minerals. Of the 370,263,838,000 cubic feet of cumulative gas production, about 77,538,303,250 cubic feet are projected to come from BLM-managed oil and gas minerals.

Both oil and gas development would be driven predominantly by infill and fringe drilling and testing shallower horizons to minimize both drilling and completion costs while simultaneously monitoring futures prices and pipeline capacity. Operators' prospect inventory would drive exploration, and they would most likely use competing economic models to minimize exposure to risk, as applied to acreages they hold and those they wish to acquire. Prospects in the planning area would be competing against other prospects of interest to operators in other basins in the U.S. and potentially around the world, as operators continually adjust their prospect inventory.

Coalbed gas production was not assessed. If any coalbed gas production does come online during the 20-year planning period, it would only be a minor part of the total gas production between 2010 and 2029.

Appendix E.8 contains a more in-depth discussion of shale gas, coal gasification, and carbon dioxide sequestration.

Table 4-4 Projected Oil and Gas Drilling Activity in the Planning Area			
Year	***Low***	***Mean***	***High***
2010	15	25	44
2011	20	29	46
2012	2	10	27
2013	27	33	48
2014	21	30	48
2015	20	30	50
2016	16	23	37
2017	18	28	49
2018	7	15	30
2019	0	6	22
2020	7	15	33
2021	11	18	32
2022	26	35	56
2023	0	5	27
2024	14	22	37
2025	17	25	42
2026	21	30	51
2027	17	29	55
2028	8	16	31
2029	15	25	45
Total Wells	**282**	**449**	**810**

Potential Surface Disturbance

Pages 65 and 66 of the Final South Dakota RFD describe unconstrained potential surface disturbance from oil, gas, and coalbed methane development on lands of all ownership. Also see Table 7, composed of Tables 7a and 7b, from the same document, which further analyzes unconstrained potential surface disturbance on lands of all ownership.

Table 4-5 below shows acres of potential surface disturbance from oil and gas development constrained by provisions of the different alternatives. Short-term disturbance is assumed to be 5.3 acres per well overall, while long-term disturbance is assumed to be 3.2 acres per well overall. Figures for coalbed methane wells (4) are left out of the table since they are less likely to be constrained by the restrictions applied to the Greater Sage-Grouse Protection Priority Areas (PPAs).

Table 4-5 Potential Surface Disturbance from Oil and Gas Drilling							
Alternative	***Total Wells Projected for BLM-Managed Federal Minerals***	***Short-Term Surface Disturbance on Federal Minerals (5.3 acres per well)***	***Long-Term Surface Disturbance on Federal Minerals (3.2 acres per well)***	***Percent of Federal Minerals Overlain by BLM Surface***	***Total Wells Projected for BLM-Managed Surface***	***Short-Term Surface Disturbance on BLM Surface (5.3 acres per well)***	***Long-Term Surface Disturbance on BLM Surface (3.2 acres per well)***
A	94	498	301	16	15	82	49
B	75	398	240	16	12	65	39
C	43	228	138	16	7	37	22
D	75	398	240	16	12	65	39

Other Potential Future Oil and Gas Activities

Shale Gas

Natural gas resources are potentially present in shales in the Oil and Gas RFD Study Area; however, currently there are no known shale gas resource economical options that extend into South Dakota. The Bakken shale resource, in parts of the Williston Basin north of the Study Area, has been shown to have a depositional limit north of the border with North Dakota. Several other carbonaceous shales, including the Tyler and Three Forks, are present within the Study Area, but their potential for containing economic gas resources is unknown. At present, there is little information available to characterize any shale gas resources that may be present within the Study Area.

Carbonaceous shale is expected to be an important future source of natural gas in the United States. At present, technology and completion methods are not available to economically produce any present natural gas that may be contained in shale in the Study Area. However, this important future gas source could become viable before the end of the planning cycle.

When and if a shale gas resource is characterized for the Study Area and technology and well completion methods are developed, this potential energy source could become important. Future development of such a resource would depend heavily on its location relative to resources already developed/developing in the Study Area. If adjacent to or overlapping existing resources, development would likely commence at a faster rate than if found to be geographically separated from such areas. Existing fields have infrastructure in place; existing wellbores may also be utilized if the resources overlap aerially. However, the nature of shale gas development options would likely require drilling of horizontal wells, so the existing wellbores would still have to be re-entered and a horizontal lateral drilled into the zone of interest using the existing wellbore as a pilot. Additional new horizontal wells would also likely be drilled. Shale has very low permeability and large hydraulic fracture stimulations would probably be necessary to liberate the gas (Bereskin and Mavor, 2003). This production may be accompanied by significant volumes of water. Also, well spacing may be dense; one well per 40 acres should be expected for vertical wells and 80 to 160-acre spacing for horizontal wells. Opportunities for development of any shale gas resource in the Study Area appear to be very low for the period extending through 2030.

Coal Gasification

Underground coal gasification may be a potential future process that is applied to coal deposits within the Study Area. This process burns the coal in-situ, producing a combustible gas with a low heating value that may be used in industrial processes and gas turbines.

Underground coal gasification is usually undertaken with coal seams that are too deep to be economically mined. Depth is a positive factor in the gasification process as the higher pressures deeper in the ground appear to give better reaction results and a gas with a higher heating value. The limiting factor with depth would be potential reduced permeability of the coal, thus reducing the ability to efficiently inject air and steam and produce the resultant gas.

Underground coal gasification uses essentially the same injection/production process that is utilized in the water flooding of oil reservoirs and in the tertiary oil recovery process using carbon dioxide. Because the coal is burned and removed, subsidence may be a problem.

Currently, this technology involving deep coal beds does not appear to be economically viable and there is no known research activity into future development in the Study Area. There are coal beds in the Study Area at depths too deep for mining but good candidates for underground gasification (e.g., Williston Basin Cretaceous and Tertiary coals); however, considering the relatively experimental status of underground coal gasification and the abundant coal found elsewhere in the region, the probability is low that this process will be utilized in the Study Area in the next 20 years.

Carbon Dioxide Sequestration

Carbon dioxide sequestration is a method of storing captured carbon dioxide gas, a greenhouse gas. The primary industrial sources of carbon dioxide include electrical power plants, oil refineries, chemical refineries, agricultural processing plants, cement works, and iron and steel production. In the Study Area, only power and cement plants and petroleum and natural gas processing (associated with pipeline infrastructure) have been identified as the major industrial sources of carbon

dioxide. Capturing and storing this gas has been proposed to reduce the environmental effects caused by releases of this gas. Three types of geologic formations have been identified as potential carbon dioxide sequestration sites. Those formation types are:

Oil and gas reservoirs – These reservoirs have hosted natural accumulations of oil and/or gas and could, in the future, be used to store carbon dioxide. The entrapment of hydrocarbons indicates that a containment seal is present and any associated water is assumed to be non-potable. Larger oil and gas reservoirs in the Study Area such as the Buffalo Field in north-central Harding County could be considered for sequestration. Carbon dioxide injected into a mature oil reservoir can enable incremental oil to be recovered. An additional 10 to 15 percent of original oil-in-place can be recovered when carbon dioxide is injected. The Buffalo Field is already undergoing secondary recovery efforts using in-situ combustion, and if a source were readily available, carbon dioxide injection may be another secondary recovery option that would further enhance recovery. Due to the relatively small size of most oil reservoirs in the Study Area compared to reservoirs in neighboring states, it is unlikely that carbon dioxide injection for sequestration purposes only (i.e., not as a benefit of carbon dioxide secondary oil recovery) would be pursued prior to the end of the planning cycle.

Unmineable coal seams - Unmineable coal seams are considered to be those that are too deep or too thin to be economically mined. Most coals in the Study Area are found in the northern portion. Many of these coals are too deep to be economically mined. If methane contained in Study Area coal beds becomes economically producible, then there could be a future opportunity to inject carbon dioxide, which could sweep additional methane from the coalbeds and allow adsorption by the coals of the carbon dioxide. Since coal beds preferentially adsorb carbon dioxide, they provide excellent storage sites. However, at present there are no existing plans to develop coals within the Study Area for coalbed methane production. It remains a possibility, however, that during the course of the planning cycle limited exploration and production of coalbed methane will commence. For instance, the Plains CO2 Reduction Partnership is currently evaluating the sequestration potential of Fort Union lignite coals in the North Dakota portion of the Williston Basin (Nelson, et al., 2005). Initial data have confirmed that the target lignite seam has sufficient thickness to support a full test of its carbon dioxide sequestration potential (Plains CO2 Reduction Partnership, 2008). Depending on the results of the study and the presence of similar lignite seams in the South Dakota portion of the Williston Basin, future carbon dioxide sequestration tests may also be performed in the Study Area. Future project development in the area depends both on successful tests and project development in North Dakota as well as a successful test in the Study Area and a nearby source of carbon dioxide for injection. It is unlikely that all these criteria will be met within the planning period; therefore, only limited activity associated with initial testing of potential lignite seams in the Study Area can be expected.

Saline formations – These saline formations were defined in the U.S. Department of Energy (2007) atlas, as porous and permeable rocks containing water with total dissolved solids greater than 10,000 milligrams per liter, which has the capacity to store large volumes of carbon dioxide. They are somewhat more extensive than coal seams or oil- and gas-bearing rocks in the Study Area, and thus have a large potential for carbon dioxide storage. Many of these potential formations are made up of reactive carbonate rocks that could potentially react with and convert the carbon dioxide into compounds for storage in the host rock.

Wind Energy Potential Development

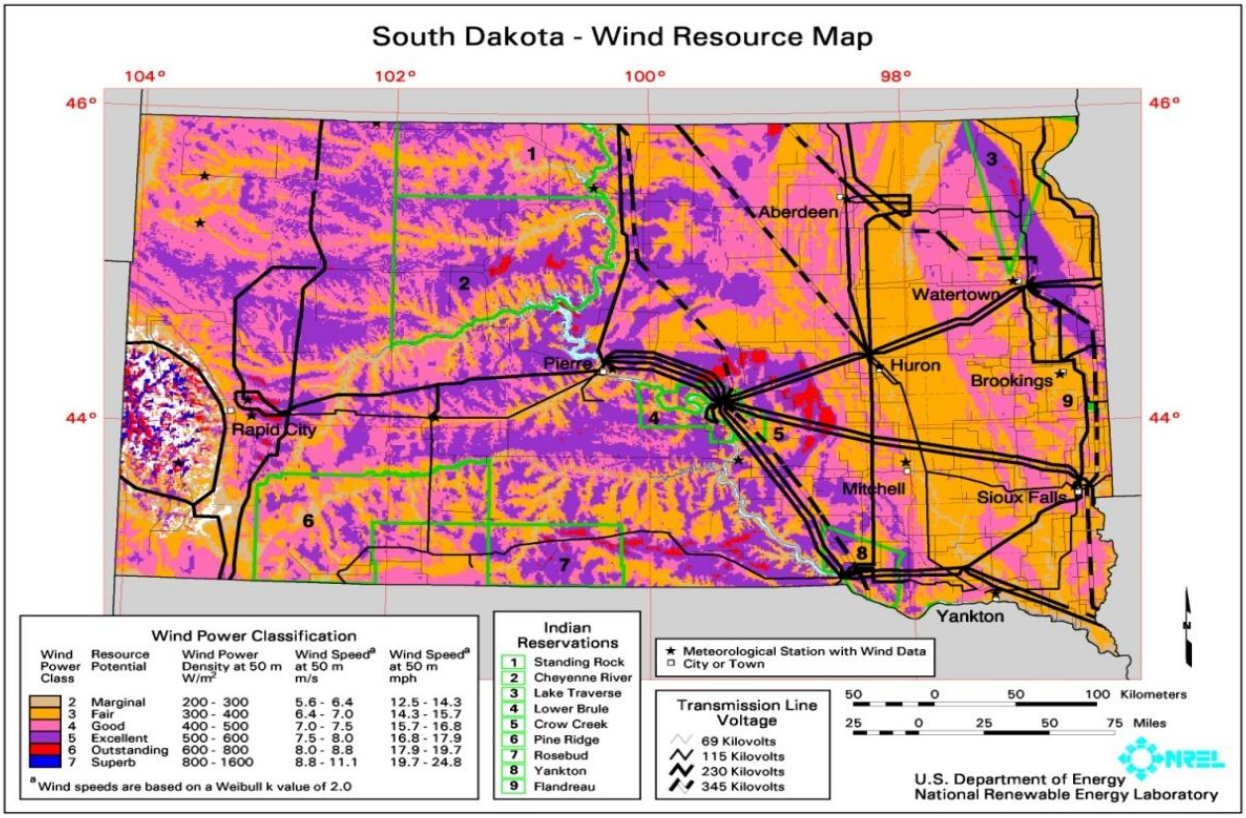
Introduction

The assumptions presented below are based on a wind energy development proposal outlined in a right-of-way application submitted in October 2010. No assumptions were made as to the location of wind energy development except that it could occur throughout the majority of the planning area. No wind farms are presently on or adjacent to BLM-administered lands in the South Dakota planning area, but wind farms are in operation in eastern South Dakota. BLM has fielded recent inquiries investigating the potential for wind energy in the western portion of the planning area and received one application on BLM-administered lands. The increasing need for energy and goals of reducing American reliance on foreign energy resources will most likely increase the demand for wind farms.

Potential

Figure 4-2 displays wind energy potential, utility lines and wind energy classes in South Dakota.

Figure 4-2
South Dakota Wind Energy Potential and Existing Transmission Lines



South Dakota has wind resources consistent with utility-scale production (the state is rated fourth nationally for wind energy potential and it is estimated that it could produce 1,030 billion kilowatt hours per year, or B KWh/Yr). Good-to-excellent wind resource areas are located throughout the state, and there is additional potential for small wind turbines in some areas. For wind energy potential, the majority of the western half of the planning area is in the good to superb categories which have the potential of 400 to 1,600 W/hr. Table 4-6 summarizes the wind power classes in South Dakota.

Table 4-6
Wind Classes and Potential

Class	*Wind Potential (BLM)*	*Wind Power Density at 50m W/m²*	*Wind Speed at 50m[a] m/s*	*Percent of BLM surface in western SD (surface estate)*
2,3	Class 2 Low Class 3 Moderate	200-400	5.6 - 7.0	21%
4,5,6,7	Classes 4-7 High	400-1600	7.0 - 11.1	76%
Unclassified				3%

Source: Wind power classes, density and speeds consolidated from Wind Power Classification DOE 2009 tables shown in Wind Resource Potential Map South Dakota (DOE 2009). Percent of planning area in each class is estimated based on overlay of Wind Resource Potential map and BLM surface estate.
[a] Wind speeds based on Weibull k value of 2.0.

The Montana/Dakotas BLM considers wind classes 1 and 2 low potential, class 3 moderate potential, and classes 4-7 high potential.

Assumptions and Limiting Factors

The lack of large capacity transmission line infrastructure in western South Dakota presents challenges in transportation of wind energy production from remote areas into the grid. Costs necessary to construct either new transmission or interconnects into existing facilities (where capacity is available) require a level of generation high enough to recoup facility investments. Transmission is a limiting factor in many areas at the present time.

Other potential limiting factors include the expiration of federal tax credits, lack of renewable energy development incentives within the state, and the current (2010) uncertain economic climate.

Current Wind Farms in South Dakota

Existing South Dakota wind energy projects are shown in Table 4-7. The largest wind energy development in South Dakota is located in Day County in northeast South Dakota. This development includes a 66 tower, 99 megawatt (MW) operation. Several small one turbine operations are located in South Dakota.

Table 4-7
Existing South Dakota Wind Energy Projects

Name	*Location*	*Power Capacity (MW)*	*Units*	*Turbine Manufacturer*	*Developer*	*Owner*	*Power Purchaser*	*Year Online*
Rosebud Sioux Wind Energy Project	Rosebud Sioux reservation	0.75	1	NEG Micon	Rosebud Sioux	Rosebud Sioux	Rosebud Sioux	2003
Canova	near Carthage	0.11	1	Micon	City of Howard	City of Howard	City of Howard	2002
Gary Wind Energy Project	Gary	0.09	1	Vestas	Energy Maintenance Services-Distributed Energy Services	Energy Maintenance Services-Distributed Energy Services	Energy Maintenance Services-Distributed Energy Services	2002
Chamberlain Wind Project	Chamberlain	2.6	2	Nordex	Crown Butte Wind Power	Basin Electric	Basin Electric/ East River Coop	2001
Howard Wind Energy Project	Howard	0.22	2	Micon	City of Howard	City of Howard	City of Howard	2001
Titan I		25	10	Clipper	BP Alternative Energy/Clipper	BP Alternative Energy/Clipper	Northwestern Energy	2009
Buffalo Ridge	Brookings County	50.4	24	Suzlon	Iberdrola Renewables	Iberdrola Renewables	NIPSCO	2009
Highmore Wind Energy Project	Highmore	40.5	27	GE Energy	FPL Energy	FPL Energy	Basin Electric	2003
Wessington Springs		51	34	GE Energy	Babcock & Brown	NextEra Energy Resources	Heartland Consumers Power District	2009
Minn-Dakota Wind Farm	Brookings County	54	36	GE Energy	PPM Energy	PPM Energy	Xcel Energy	2007
Tatanka Wind Project	McPherson County	88.5	59	Acciona	Acciona Energy	Acciona Energy		2008
Day County Wind Project		99	66	GE Energy	NextEra Energy Resources	NextEra Energy Resources	Basin Electric	2010

Source: American Wind Energy Association 7/20/10. http://awea.org/

Wind Energy Facility Components

Once right-of-way approvals have been obtained and turbine siting is finalized, construction of a development can proceed. Only two to five percent of the total land required for wind energy production is actually occupied by the turbine foundations and access roads. The remaining land is compatible with rural land use, such as farming and ranching.

Appropriate access to the area is critical. A road width of 40 feet is usually required in order to accommodate the large trailers and crane equipment necessary to transport and erect the turbines. Upon completion of construction, roads can generally be reclaimed to a narrower width for operations and maintenance of the wind facility.

Centralized staging areas are often established to orchestrate construction and store supplies and equipment. Each turbine location, once sited, requires concrete foundation work and a "laydown" area where turbine assembly will occur. Turbines are connected with buried connector lines which eventually terminate at a collector substation, where power is stepped up to a compatible voltage to be tied into the power grid. These lines are usually placed alongside the road system. Occasionally, terrain considerations or geotechnical studies necessitate above ground or aerial collector systems. Fencing around turbines is normally not required; substations are generally fenced.

A building for operations and maintenance is also a standard component of a wind energy development. Wind energy facilities are expected to be long-term uses of the landscape where they are constructed; however, proper reclamation of disturbance occurring from construction activities can reduce the footprint of the facilities.

Table 4-8 is a summary estimate of the electric output and acres of disturbance from unconstrained wind energy development. This summary assumes all development would occur on public land and that turbines would not exceed 3.5 megawatts in size. Currently, 1.5 megawatt turbines comprise the standard among operating wind farms in the United States. However, larger turbines are beginning to appear in onshore wind facilities and the trend appears to be toward larger turbines with greater megawatt generation capacities. These assumptions use a 3.5 megawatt turbine as a projection of size and type that might be expected over the life of the plan. This summary does not include transmission lines. A summary of wind energy potential development by alternative is shown in Table 4-9.

Table 4-8
Summary of Wind Energy Potential Development - Unconstrained

Number of Turbines		220	
Turbine Size (MW)		3.5	
Overall Acres (footprint)		9,640	
Power Generated (MW)		770	
	Acres Disturbed (Short-Term Disturbance)	***Acres Reclaimed***	***Remaining Acres of Disturbance after Reclamation (Long-Term Disturbance)***
Operations &Maintenance Buildings	7	4	3
Collector Substation	5	2	3
Collector System	134	134	0
New Access Roads	25	15	10
Internal Road Network	436	155	281
Turbine String Turnaround Areas	36	36	0
Wind Turbine Foundations	2	1	1
Pad-Mounted Transformers	2	0	2
Turbine Work Areas/Material Staging	548	548	0
Total Acres	**1,195**	**895**	**300**

The figures in Table 4-9 were derived based on GIS analysis utilizing several factors: the type and location of renewable energy ROW restrictions, the wind energy classes that the ROW restriction affected, and the amount of land required for wind energy development (spacing of turbine and other facilities) based on a review of other wind energy farms. The

amount of development expected under each alternative was reduced commensurate with the amount of land closed to renewable energy ROWs by wind energy class with consideration of other management needs and uses and protection of resources through various other management actions. Wind energy classes were lumped into two categories: classes 1-3 considered unlikely to be developed and classes 4-7 considered as potential development areas.

Table 4-9
Summary of Wind Energy Potential Development by Alternative*

	Alternative A (Current Management)	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Number of Turbines	169	141	57	95
Turbine Size (MW)	3.5	3.5	3.5	3.5
Power Generated (MW)	593	493	199	331
Acres Disturbed Prior to Reclamation (Short-Term Disturbance)	924	768	311	520
Acres Not Reclaimed (Long-Term Disturbance)	231	192	78	130
Percent of BLM surface available in moderate potential (class 3) and high potential (classes 4-7).	77	64	26	43

*Assumes that areas restricted by renewable energy ROW exclusions would not be developed and 25 percent of areas restricted by ROW avoidance would be available for development after environmental review at the project level.

Impacts to Resources from the Alternatives

Air Resources

Assumptions and Guidelines

The air resources impact analysis includes emission inventories for each alternative and qualitative descriptions of potential impacts to air pollutant concentrations and air quality related values, including visibility and deposition.

Emission inventories include BLM sources and non-BLM sources within the planning area. Criteria air pollutants include CO, NO_x, ozone, $PM_{2.5}$, PM_{10}, and SO_2, as well as VOCs, which are ozone precursors. HAPs, such as benzene and toluene, are also included in the inventories. Due to a lack of lead-emitting sources, lead emissions were not estimated. As described in Chapter 3, ozone is not emitted directly into the atmosphere; instead, it is formed in atmospheric reactions involving NO_x and VOCs. Emissions of GHGs (CO_2, CH_4, and N_2O) are described in the Climate Change impact analysis. Emission inventories, modeling methods, and modeling results are included in the South Dakota Field Office (SDFO) Resource Management Plan Air Resource Technical Support Document (ARTSD) (BLM 2013). A copy of the emission inventories is located in Appendix S.

Impacts Common to All Alternatives

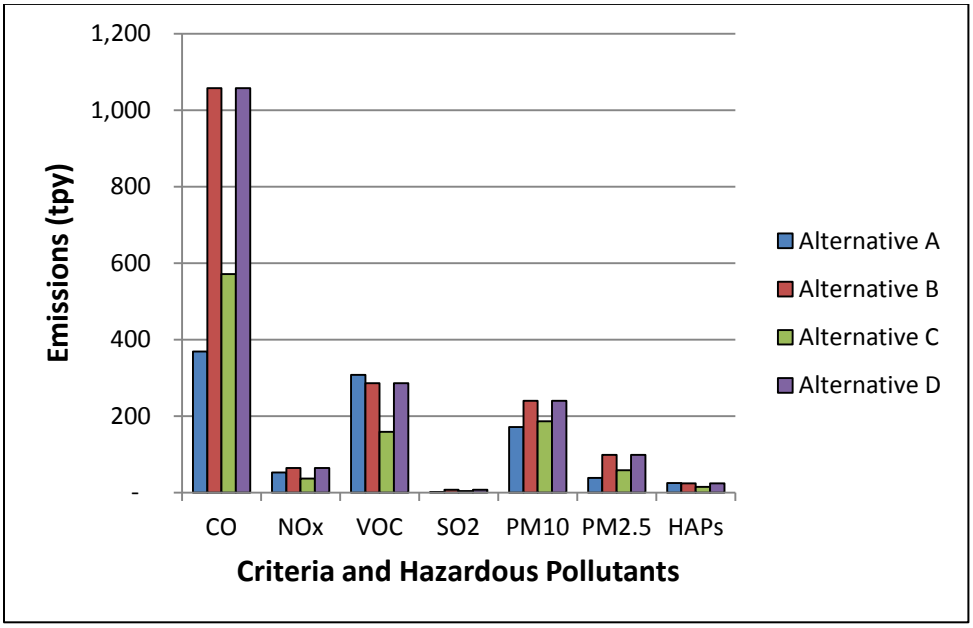
Air Pollutant Emissions

BLM emission sources include fuels management (prescribed fire, mechanical vegetation treatment); energy development (conventional natural gas, coalbed natural gas, and oil); mineral development (primarily bentonite); resource road maintenance; forest and woodland treatments; and livestock grazing. These emissions would be long-term emissions because most activities would be expected to occur over the life of the plan. However, if activities cease, concentrations of criteria air pollutants and HAPs would decrease due to the emission reductions. In this respect, air resource impacts would be short-term, reversible impacts. BLM emissions of criteria pollutants and HAPs are shown in Figure 4-3.

For each of the Alternatives, the largest BLM-authorized criteria pollutant and HAP emission sources would be associated with fuels management, energy development, and bentonite mining. 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 BLM road travel would not be expected to increase over current activity levels and emissions from these activities would remain relatively constant. Consequently, emissions from many ongoing resource management activities would not represent increases to regional emissions. However, oil and gas 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 were generally based on emission standards required by the South Dakota Department of Environmental and Natural Resources (SD DENR) and the Environmental Protection Agency (EPA). One exception is that emission estimates were based on use of Tier 4 nonroad engine standards for diesel drill rig engines, which would be required under best management practices and as an initial mitigation measure. 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 Appendix S. 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 include more stringent emission controls expected to be mandated by EPA on August 16, 2012. New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) will substantially decrease emissions from many types of oil and gas equipment (GPO 2012). For example, the final rule will decrease national oil and gas VOC emissions by approximately 25 percent and will also substantially decrease HAP emissions. Some of these emission reduction requirements apply only to sources with emissions exceeding specified levels. For those types of sources, the oil and gas emission inventories assume no control in order to be conservative. Because some of these sources would be subject to control, the emission inventories overestimate emissions.

Figure 4-3
Criteria and Hazardous Air Pollutant Emissions from BLM-Authorized Sources in the Planning Area



Emissions associated with each of the alternatives represent a small fraction of EPA's National Emission Inventory (NEI) emissions reported for calendar year 2008, as shown in Table 4-10. Criteria pollutant emissions associated with management actions included in this RMP would be between 0.8 percent and 5.4 percent of total emissions in the ten South Dakota counties containing 99 percent of BLM-administered land within the state (Butte, Custer, Fall River, Haakon, Harding, Lawrence, Meade, Pennington, Perkins, and Stanley Counties). NEI emissions include stationary

sources, nonroad sources, and vehicle sources. However, NEI emissions do not necessarily include all existing oil and gas emissions, since small sources and many fugitive emissions may not be included. 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 oil and gas activity vary from 0.1 percent to 3.3 percent of NEI emissions.

Table 4-10
Estimated Maximum Annual Criteria Pollutant Emissions as a Percentage of Existing Emissions

	Percentage of Total Emissions Within Planning Area Counties (%) [1]					
Alternative	***CO***	***NOx***	***VOC***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
Alternative Emissions for Multi-Resource Activities Excluding Wildfire Smoke [2, 3]						
A	0.8%	0.6%	3.4%	1.3%	1.1%	1.7%
B	2.3%	0.8%	3.2%	5.4%	1.6%	4.3%
C	1.2%	0.4%	1.8%	2.7%	1.2%	2.5%
D	2.3%	0.8%	3.2%	5.4%	1.6%	4.3%
Increase in Oil and Gas Activity Emissions [4]						
A	0.2%	0.5%	3.3%	0.1%	0.1%	0.2%
B	0.2%	0.4%	2.6%	0.1%	0.1%	0.1%
C	0.1%	0.2%	1.5%	0.0%	0.1%	0.1%
D	0.2%	0.4%	2.6%	0.1%	0.1%	0.1%

[1] Counties included in the NEI comparison include Butte, Custer, Fall River, Haakon, Harding, Lawrence, Meade, Pennington, Perkins, and Stanley counties.
[2] Wildfire smoke emissions are excluded since they are caused by natural events and are not included as part of the NEI.
[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 NEI emissions because they are associated with new well development and production.

Near-Field Criteria Air Pollutant Concentrations

Impacts to criteria air pollutant concentrations would be direct impacts with durations similar to the duration of emission-producing activities. Near-field dispersion modeling was performed for oil and gas development and production using the AERMOD model, which is the EPA guideline model for estimating near-field air quality impacts for most air pollutants. AERMOD is suitable for modeling near-field receptors up to a distance of 50 kilometers from emission sources, and provides conservative estimates of potential air quality impacts. Ozone (and VOC ozone precursors) is not predicted with AERMOD because it cannot model the chemical transformations associated with atmospheric ozone formation. Ozone would be modeled using photochemical grid modeling (PGM) when sufficient emission and monitoring data become available to perform this type of modeling as described in Appendix S. Detailed information describing AERMOD emissions, meteorology, modeling parameters, and data processing is provided in the ARTSD and is summarized below (BLM 2013).

Three well pad development scenarios (construction, drilling, and completion) were modeled at a central well pad. Well development activities would be temporary and would occur at different times at a well pad. Well pad construction would occur first over a period of up to three days of active site construction involving soil movement (e.g., digging and grading). Drilling would occur next, with up to 16 days of active drilling. Then well completion would occur over up to five days. Once well development is complete, a long-term production phase typically begins. The construction modeling scenario has the greatest short-term (24-hr) emission rates for PM_{10} and $PM_{2.5}$. Temporary drilling activities account for the greatest short-term (1-hr) 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 operating wells surrounding the central pad. These emissions were modeled concurrently with each of the three well development scenarios (construction, drilling, and completion). Emission inventories and modeling methods are described in more detail within the ARTSD (BLM 2013).

Potential emissions from each of the scenarios were modeled and the resulting modeled concentrations were compared to Prevention of Significant Deterioration (PSD) increments (described below). Ambient background concentrations represent current air quality. Comparisons to the National Ambient Air Quality Standards (NAAQS) and South Dakota Ambient Air Quality Standards (SDAAQS) were done by adding modeled concentrations that reflect additional oil and gas activity to background concentrations and comparing the total concentrations to the standards. The results of the near-field modeling performed for Alternative A are provided in Table 4-11. 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, and D, the Alternative A modeling results conservatively predict impacts that could occur in localized areas under each of the alternatives.

Table 4-11 provides the largest predicted concentration (in the form of the standards) that was modeled for each scenario and for each modeled year (2007-2011). Additional modeling results are included in the ARTSD (BLM 2013). The maximum total 1-hr CO concentration of 1,332 µg/m^3 was predicted based on drilling activities using meteorology from year 2008. Approximately 23 percent of the total 1-hr CO concentration was attributable to modeled sources. In contrast, modeled activities accounted for up to 67 percent of total 24-hr PM_{10} predicted concentrations. Predicted concentrations are well below the NAAQS, 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 24-hour PM_{10} and 24-hour $PM_{2.5}$ standards. The maximum 1-hour NO_2 impacts were due to heavy-duty construction equipment exhaust during the brief well construction period, as were maximum 24-hour PM_{10} and $PM_{2.5}$ impacts. Predicted ambient concentrations associated with production activities are much less than emissions associated with temporary activities.

Table 4-11
Oil and Gas Activity Near-Field Criteria Air Pollutant Concentration Summary for All Alternatives

Pollutant	*Avg. Period*	*Model Output Rank*	*Modeled Concentration (µg/m^3)*	*PSD Increment (µg/m^3)*		*Background Concentration [1] (µg/m^3)*	*Total Concentration (µg/m^3)*	*NAAQS (µg/m^3)*	*Percent of NAAQS*
				Class I	*Class II*				
CO	1-hour	H2H	301	None	None	1,030	1,332	40,000	3%
	8-hour	H2H	216	None	None	343	470	10,000	6%
NO_2	1-hour	H8H [2]	49.9	None	None	9	59	188	32%
	Annual	H1H [3]	0.27	2.5	25	1.9	2.15	100	2%
PM_{10}	24-hour	H2H	81	8	30	40	121	150	80%
$PM_{2.5}$	24-hour	H8H [4] (H2H) [6]	7.0 (12.3)	2	9	11	19	35	51%
	Annual	H1H	0.77	1	4	3.8	4.6	12.0	38%
SO_2	1-hour	H4H [5]	2.2	None	None	18	21	196	10%
	3-hour	H2H	2.5	5	91	0	2.5	365	1%

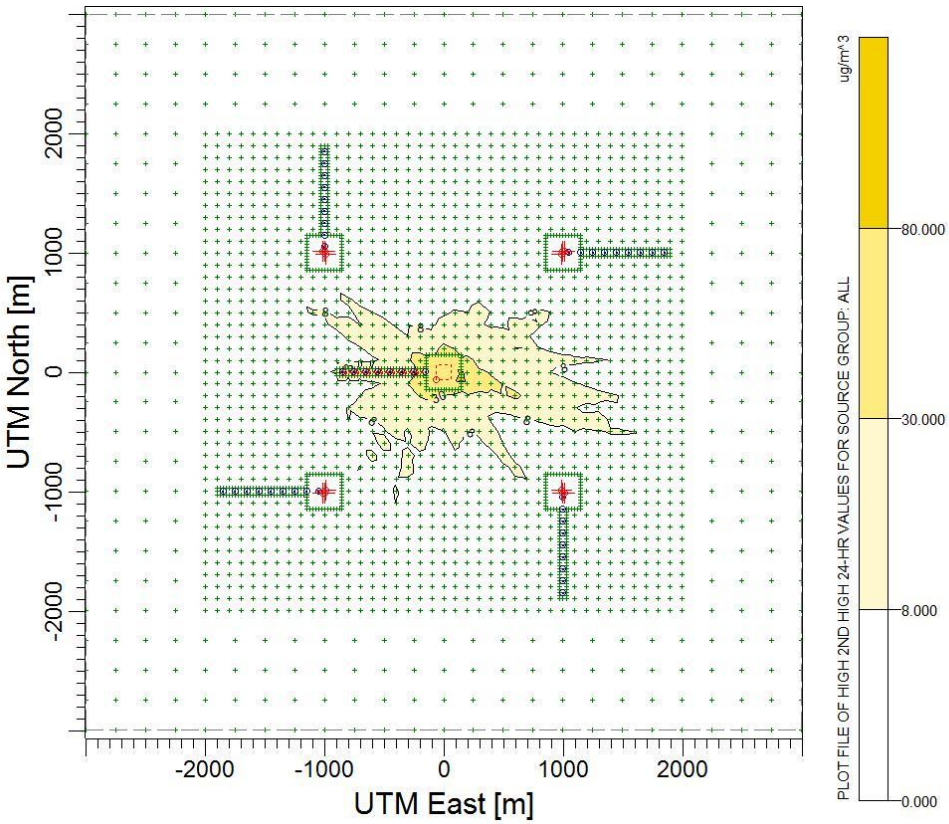
H1H = highest-first-high
H2H = highest-second-high
H4H = highest-fourth-high
H8H = highest-eighth-high
µg/m^3 = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
PSD = Prevention of Significant Deterioration
[1] Background concentrations were provided by the SD DENR (SD DENR 2012c).
[2] Five-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] Five-year average of the 98th percentile (H8H) 24-hour modeled $PM_{2.5}$ concentrations.
[5] Five-year average of the 99th percentile (H4H) 1-hour modeled SO_2 concentrations.
[6] 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 has the potential to emit at least 100 tons per year (tpy) or 250 tpy of criteria air pollutants. 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 disclose potential short-term air quality impacts.

EPA established PSD increments for Class I areas (e.g., national parks and large wilderness areas) and Class II areas (all non-Class I areas in South Dakota). 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 PM_{10} and $PM_{2.5}$ concentrations greater than the Class II PSD increments are predicted to occur during construction (PM_{10} only) and completion and construction activities ($PM_{2.5}$). If oil and gas activities would be located adjacent to a Class I area, temporary concentrations above the PM_{10} Class I increment might occur during construction and completion. Similarly, temporary concentrations above the $PM_{2.5}$ Class I increment might occur during construction, drilling, and completion.

Air pollutant concentrations generally decrease as distance from the source increases. Figure 4-4 provides an illustration of 24-hr PM_{10} modeled concentrations during 2009. 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 the PSD Class I increment would be exceeded on the day of the year with the second-highest PM_{10} modeled concentration. On this day, the maximum extent with a predicted concentration above the Class I increment would be approximately 1,500 meters. Concentrations of this magnitude could occur on days when well pad construction activity is concurrent with meteorological conditions causing the greatest ambient PM_{10} concentration. Impacts of the magnitude shown are unlikely to occur because construction activity typically occurs for three days or less and five full years of modeling were performed with assumed maximum emission rates,

Figure 4-4
Example of Extent of Area Exceeding the PM_{10} 24-hour PSD Increments during Construction



Near-Field Hazardous Air Pollutant Concentrations

Impacts to HAP concentrations would be direct impacts with durations similar to the duration of emission-producing activities. Similar to the criteria air pollutant modeling, near-field HAP modeling was conducted to determine predicted ambient air quality impacts of HAP emissions. Additional HAP modeling results are included in the ARTSD (BLM 2013). HAPs are defined by EPA as toxic air pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. HAP modeling consisted of the same three scenarios modeled for criteria air pollutants. 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, one year) exposures. The short-term thresholds used in the analysis consisted of acute Reference Exposure Levels (RELs) and are defined as short-term concentrations at or below which no adverse health effects are expected. The long-term non-carcinogenic thresholds used in the analysis consisted of chronic Reference Concentrations (RfCs) and are the threshold at which no long-term, non-carcinogenic adverse health effects are expected. The long-term carcinogenic thresholds used in the analysis consisted of Unit Risk Factors (URFs) to estimate the increased risk of contracting cancer that is associated with the ambient concentration of the HAP being analyzed. Six HAPs were modeled, consisting of benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene. Table 4-12 provides a breakdown of the health effects for each modeled HAP.

Table 4-12
Health Effects of Modeled HAPs

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	

Table 4-13 presents the results of the acute HAP modeling. Acute HAP modeling impacts were well below the RELs. Table 4-14 presents the results of HAP modeling of potential chronic effects and compares them to RfCs.

Table 4-13
Acute Short-Term HAP Modeling Results for All Alternatives

HAP	*Modeled 1-Hour Concentration ($\mu g/m^3$)*	*REL ($\mu g/m^3$)*	*Percent of REL*
Benzene	0.989	1,300	<0.1%
Ethyl Benzene	2.82	350,000	<0.1%
Formaldehyde	5.32	55	9.7%
N-Hexane	10.0	390,000	<0.1%
Toluene	0.97	37,000	<0.1%
Xylene	0.47	22,000	<0.1%

Table 4-14
Chronic Non-Carcinogenic HAP Modeling Results for All Alternatives

HAP	*Modeled Annual Concentration ($\mu g/m^3$)*	*RfC ($\mu g/m^3$)*	*Percent of RfC*
Benzene	0.016	30	<1%
Ethyl Benzene	0.068	1,000	<0.1%
Formaldehyde	0.017	10	0.20.%
N-Hexane	0.19	700	<0.1%
Toluene	0.019	5,000	<0.1%
Xylene	0.52	100	0.5%

Of the HAPs evaluated, only benzene, ethyl benzene, and formaldehyde are identified by EPA as being carcinogens. Cancer unit risk factors (URFs) were derived based on assuming a person is exposed to a HAP for a 70-year lifetime. Cancer risk was estimated by multiplying the annual model-predicted concentrations by the URF for each carcinogen. The resulting calculations were then scaled by adjustment factors to represent the most likely exposure (MLE) and maximally exposed individual (MEI) risks. The MEI adjustment takes into account the lifetime of the project, which was assumed to be 50 years. The MLE 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 4-15 presents the results of the carcinogenic HAP modeling for both the MLE and MEI exposure assumptions. Maximum predicted cancer risks for all modeled scenarios and HAPs are below an incremental increase in cancer risk of 1 per million.

Table 4-15
Carcinogenic HAP Modeling Results for All Alternatives

HAP	*Modeled Annual Concentration ($\mu g/m^3$)*	*URF ($\mu g/m^3$) $^{-1}$*	*Adjustment Factor*	*Cancer Risk (Per Million)*	*Risk Exceeds 1 Per Million?*
Most Likely Exposure (MLE)					
Benzene	0.016	7.80×10-6	0.0949	0.01	No
Ethyl Benzene	0.062	2.50×10-6	0.0949	0.02	No
Formaldehyde	0.017	1.30×10-5	0.0949	0.02	No
Maximally Exposed Individual (MEI)					
Benzene	0.016	7.80×10-6	0.71	0.09	No
Ethyl Benzene	0.067	2.50×10-6	0.71	0.12	No
Formaldehyde	0.017	1.30×10-5	0.71	0.16	No

Far-Field Criteria Air Pollutant Concentrations

Due to the relatively low density of expected oil and gas activity in most of the planning area, far-field criteria air pollutant concentrations are expected to remain low. The following qualitative assessment describes potential impacts based on available data.

Ozone is the pollutant with ambient concentrations closest to the NAAQS based on a percentage basis. Ozone concentrations are variable and highly dependent on weather conditions. Compliance with the ozone NAAQS is based on a three-year average of the fourth highest daily maximum 8-hour concentration. The nearest rural ozone monitors in potential oil and gas areas are located at Wind Cave National Park (NP) and Badlands NP. The 2009–2011 averages were 0.060 and 0.055 ppm, respectively. These values are equivalent to 80 percent and 73 percent of the standard, respectively.

NO_x and VOC emissions contribute to ozone formation. Cumulative emission increases were estimated to be up to 0.5 percent for NO_x and up to 3.3 percent for VOCs. However, more stringent VOC emission controls for oil and gas sources will decrease VOC emissions below the levels shown in Table 4-10. Predicted emission increases would be unlikely to cause or contribute to a violation of the ozone NAAQS.

Qualitative assessments of far-field air resource impacts for additional criteria air pollutants are provided below. Emission increases are based on emission increases in oil and gas activity; other activities are likely to continue at current or slightly decreased levels.

- CO — CO concentrations are not monitored in western South Dakota An emission increase within the planning area of up to 0.2 percent would cause a negligible increase in CO concentrations.

- NO_2 —NO_2 concentrations at Badlands NP are approximately 4 percent and 2 percent of the 1-hour and annual NAAQS, respectively. A NO_x emission increase of up to 0.5 percent in the planning area would cause a negligible increase in NO_2 concentrations in most areas. A larger increase in ambient concentrations may occur in some localized areas where large engines operate continuously.

- SO_2 — SO_2 concentrations at Badlands NP are very low, at 1–9 percent of the NAAQS, depending on the averaging time. Because increased SO_2 emissions would be 0.1 percent of planning area emissions and would be dispersed over large areas, these emissions would cause a negligible increase in SO_2 concentrations.

- PM_{10} — PM_{10} concentrations at Wind Cave NP are approximately 53 percent of the NAAQS. An emission increase of approximately 0.1 percent would cause a negligible increase in PM_{10} concentrations in most areas. At locations with construction activities, vehicle traffic on unpaved roads, or off-road travel, temporary PM_{10} concentration increases may be moderate or could be high for short periods of time if adverse weather conditions occur.

- $PM_{2.5}$ — $PM_{2.5}$ concentrations at Wind Cave NP are approximately 32 percent of the 24-hour and 40 percent of the revised annual primary NAAQS of 12 $\mu g/m^3$. An emission increase of approximately 0.2 percent in the planning area could cause a negligible increase in $PM_{2.5}$ concentrations. At locations with construction activities, vehicle traffic on unpaved roads, or off-road travel, temporary $PM_{2.5}$ concentration increases may be moderate or could be high for short periods of time if adverse weather conditions occur.

- Lead — Lead emissions would be negligible and no measurable increase in lead concentrations is expected.

Future monitoring data and PGM results would inform BLM air quality management actions, as described in the ARMP in Appendix S.

Far-Field AQRV Impacts

The best modeling method to determine far-field AQRV impacts for large modeling domains is PGM, which can model long-range regional transport of air pollutants that cause atmospheric deposition and visibility impacts. Reliable PGM requires comprehensive regional emission inventories and ambient monitoring data throughout the 48 contiguous United States. As described in the ARMP in Appendix S, the BLM is actively acquiring needed data to perform PGM, which is expected to be completed after this RMP is complete. For the Draft RMP, the following qualitative analysis is provided for atmospheric deposition and visibility.

Atmospheric Deposition. Sulfur and nitrogen deposition impacts would likely be minor at Class I and sensitive Class II areas. Increases in NO_x and SO_2 emissions would be less than 0.5 percent and 0.8 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). Precipitation pH would be unlikely to become more acidic due to these predicted emission increases. The closest Class I areas to oil and gas development areas are the Badlands Wilderness and Wind Cave National Park. With regard to potential sensitive Class II areas, Mount Rushmore National Memorial, Jewel Cave National Monument, Black Elk Wilderness, Standing Rock Indian Reservation, Cheyenne River Indian Reservation, and Devil's Tower National Monument would be most likely to see small increases in deposition. As part of a future photochemical modeling effort, deposition impacts would be assessed as described in the ARMP included in Appendix S.

Lake Acidification. Due to small increases in sulfur and nitrogen deposition, potential lake acidification impacts would be minor at Class I and sensitive Class II areas. As part of a future photochemical modeling effort, lake acidification impacts would be assessed as described in the Air Resource Management Plan included in Appendix S.

Visibility. A qualitative analysis of visibility impacts based on the relative emission increase is provided below. Potential visibility impacts are likely to be small for the following reasons.

- Increases in emissions of haze-inducing pollutants (primarily SO_2, NO_x, and $PM_{2.5}$) would be low.
- Emission sources would be spread over a large geographic area that would likely lead to low concentration increases of haze-inducing pollutants.

Under the highest-emission alternative, total emissions of NO_x and SO_2 would be approximately 71 tons per year (tpy), compared to NEI emissions of 8,617 tpy. This represents a regional emission increase of 0.8 percent. 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 nearby Class I and sensitive Class II areas would be assessed as described in Appendix S.

ARMP and Adaptive Management Strategy for Oil and Gas Resources

The ARMP for oil and gas activities is provided in Appendix S. 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 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 South Dakota Department of Environment and Natural Resources (SD DENR) 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 small oil and gas emission sources are not required to obtain air quality permits from the SD DENR, unlike large stationary sources such as coal mines that are permitted and inspected by the SD DENR. The oil and gas adaptive management strategy was prepared in collaboration with the U.S. Environmental Protection Agency (EPA) 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* (USDI 2011). This Memorandum of Understanding (MOU) is summarized in Appendix S.

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 PGM 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 PGM, 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
- Mitigation

Pollutants addressed by the ARMP include NO_2, O_3, PM_{10}, and $PM_{2.5}$. The ARMP also addresses modeling and mitigation for the following AQRVs.

- Deposition of sulfur and nitrogen
- Lake acid neutralizing capacity
- 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.

Impacts from Other Resources

Climate: Air quality impacts from climate change may include increases in ambient ozone concentrations and increases or decreases in particulate matter concentrations (EPA 2009c). Increased temperatures associated with climate change have the potential to increase ground-level ozone formation, though this effect would be more pronounced in regions that have 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, though there is much uncertainty in this regard. The potential cumulative impact of climate change on PM_{10} and $PM_{2.5}$ is less well understood. A range of increases and decreases in PM_{10} and $PM_{2.5}$ 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.

Fire Management and Ecology: 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 (CO, NO_x, VOC, SO_2, PM_{10}, and $PM_{2.5}$) and HAPs. Prescribed burns are begun only when atmospheric conditions provide safe fire control conditions and when ambient concentrations of fire-related pollutants will be acceptable. The size of the prescribed fire, and the current and expected weather conditions including the predicted wind speed and direction, are reviewed prior to burning to assure good smoke dispersal. Prescribed burns are completed in a manner that is consistent with the State of South Dakota Guidelines for Open Burning. The majority of prescribed burning would occur in forested areas in or near the northern Black Hills.

Wildfire smoke quantities and pollutant concentrations vary with the amount and type of fuel burned and atmospheric conditions. Wildfires cause short-term emissions due to smoke and the use of heavy equipment during fire suppression activities. Long-term wildfire impacts include increased fugitive dust emissions due to lack of vegetative ground cover. In addition, intense wildfires can alter soil chemistry and reduce future vegetative growth. Fire mitigation activities following wildfires 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 such as the Badlands Wilderness and Wind Cave National Park. With regard to sensitive Class II areas, Mount Rushmore National Memorial, Jewel Cave National Monument, Black Elk Wilderness, Standing Rock Indian Reservation, Cheyenne River Indian Reservation, and Devil's Tower National Monument could be affected. In addition to increased concentrations of particulate, CO, 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.

Fluid Minerals: Oil and gas development and production activities in the planning area would increase criteria air pollutant and HAP emissions due to engine exhaust, fugitive organic emissions, and fugitive dust.

Livestock Grazing: Livestock grazing has the potential to affect air quality due to 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 are being achieved. Adjustments to the grazing authorization would be made as needed to ensure that fugitive dust emissions are not excessive.

Recreation: Few developed recreation sites are located within the decision area. Limited hunting, dispersed limited camping, hiking, and off-road travel occur within the area. Recreational uses may cause negligible localized emission increases due to vehicle exhaust and small areas of surface disturbance. Due to the low level of recreational activities, emissions from recreational activities were not included in the emission inventory.

Soil Resources: Soil management occurs as an integral part of many activities, including oil and gas development, road maintenance, mining, fire management, forestry 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 revegetating areas after project completion. Additionally, 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, but could create short-term increases in fugitive dust and exhaust emissions during and immediately following project implementation.

Solid Minerals: Bentonite mining is the largest solid mineral mining activity within the planning area and it is 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 $PM_{2.5}$) from material handling, wind erosion from material stockpiles, and vehicle traffic. Additional pollutants would include CO, NO_x, SO_2, VOCs, and HAPs from engine exhaust.

Travel Management: Air quality impacts from vehicle travel, including road maintenance and OHV use, would result from fugitive dust and exhaust emissions. Travel-related impacts depend on the route/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 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, travel-related emissions may remain constant in the planning area regardless of road closure and restrictions.

Fugitive dust from wind erosion would decrease in areas where road closures allow native plants to re-colonize 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 in resource-specific management activities, such as fire management and vegetation management.

Vegetative Communities: 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.

Wildlife and Special Status Species: 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 may 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.

Forests and Woodlands: Short-term fugitive dust emissions would occur primarily while woodland treatments are in progress. Emissions of CO, NO_x, PM_{10}, $PM_{2.5}$, SO_2, VOCs, and HAPs would be released from vehicles and equipment used during these activities. Over the long term, revegetation and land reclamation would reduce fugitive dust.

Lands and Realty: Air quality 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 right of way 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.

Impacts under Alternative A (Current Management)

Alternative A would have the highest level of oil and gas activity and relatively low prescribed burning. VOC and HAP emissions would be greatest under Alternative A. In contrast, this alternative has the lowest emissions of CO, SO_2, PM_{10}, and $PM_{2.5}$. Resource-specific emissions are provided in Table 4-16. Criteria air pollutant concentrations would be expected to remain below NAAQS. In addition, HAP concentrations would be expected to be below health-based exposure limits and carcinogenic risk thresholds.

Table 4-16
BLM Source Emissions under Alternative A (Current Management) (Tons/Year)

Resource	***CO***	***NOx***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***	***VOC***	***HAP***
Oil and Gas							
Oil	83	36	0	16	3	286	18
Natural Gas	17	6	0	3	1	10	2
Coalbed Natural Gas	2	1	0	1	0	1	0
Bentonite Mining	66	0	0	71	11	0	0
BLM Travel	1	0	0	9	1	0	0
BLM Road Maintenance	0	0	0	0	0	0	0
Fire Management [1]	198	6	1	59	21	11	4
Forestry Management	2	3	0	3	1	0	0
Livestock Grazing	0	0	0	8	1	0	0
Vegetation Management	0	0	0	1	0	0	0
BLM Emission Total	**369**	**52**	**1**	**171**	**39**	**308**	**25**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

Impacts under Alternative B

Alternative B would have less oil and gas activity and more prescribed burning than Alternative A. The following activities would be identical to those for Alternative A and estimated emissions would be the same: bentonite mining, BLM travel, BLM road maintenance, and vegetation management. Slight differences in activity levels are associated with forestry management and livestock grazing, though criteria air pollutant emission differences are small for these activities. Alternative B emissions of CO, NO_x, SO_2, PM_{10}, and $PM_{2.5}$ are greater than those for Alternative A. Resource-specific emissions are provided in Table 4-17. Criteria air pollutant concentrations would be expected to remain below NAAQS. In addition, HAP concentrations would be expected to be below health-based exposure limits and carcinogenic risk thresholds.

Table 4-17
BLM Source Emissions under Alternative B (Tons/Year)

Resource	***CO***	***NOx***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***	***VOC***	***HAP***
Oil and Gas							
Oil	67	29	0	13	3	230	14.5
Natural Gas	15	5	0	3	1	8	1.9
Coalbed Natural Gas	2	1	0	1	0	1	0.1
Bentonite Mining	66	0	0	71	11	0	0.0
BLM Travel	1	0	0	9	1	0	0.0
BLM Road Maintenance	0	0	0	0	0	0	0.0
Fire Management [1]	905	25	7	130	82	47	7.6
Forestry Management	2	3	0	3	1	0	0.0
Livestock Grazing	0	0	0	9	1	0	0.0
Vegetation Management	0	0	0	1	0	0	0.0
BLM Emission Total	**1,058**	**64**	**7**	**240**	**99**	**286**	**24.2**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

Impacts under Alternative C

Alternative C would have less oil and gas activity than Alternative A and nearly identical activity to Alternative B. Fire management and forestry management activities would be greater than Alternative A and less than Alternative B. Alternative C would have the lowest emissions of NO_x, VOCs, and HAPs compared to each of the other alternatives. Resource-specific emissions are provided in Table 4-18. Criteria air pollutant concentrations would be expected to remain below NAAQS. In addition, HAP concentrations would be expected to be below health-based exposure limits and carcinogenic risk thresholds.

Table 4-18
BLM Source Emissions under Alternative C (Tons/Year)

Resource	***CO***	***NOx***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***	***VOC***	***HAP***
Oil and Gas							
Oil	37	16	0	7	1	129	8
Natural Gas	8	3	0	1	0	4	1
Coalbed Natural Gas	2	1	0	1	0	1	0
Bentonite Mining	66	0	0	71	11	0	0
BLM Travel	1	0	0	9	1	0	0
BLM Road Maintenance	0	0	0	0	0	0	0
Fire Management [1]	456	13	3	85	43	24	5
Forestry Management	2	3	0	3	1	0	0
Livestock Grazing	0	0	0	8	1	0	0
Vegetation Management	0	0	0	1	0	0	0
BLM Emission Total	**571**	**36**	**4**	**186**	**59**	**159**	**15**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

Impacts under Alternative D (Preferred Alternative)

Alternative D would have the same activity levels and emissions as Alternative B.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Cumulative air quality impacts were assessed by estimating emissions from oil and gas activity on non-BLM mineral estate within the planning area and adding these emissions to the estimated BLM-authorized emissions described above. Non-BLM oil and gas emission estimates were based on the oil and gas RFD prepared for the area and are shown in Table 4-19.

Table 4-19
Cumulative Emissions (tpy) [1]

Alternative	*CO*	*NO_x*	*VOC*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*	*HAP*
A	748	356	1,504	6	249	60	109
B	1,437	367	1,482	11	317	120	109
C	951	343	1,355	8	264	80	99
D	1,437	367	1,482	11	317	120	109

[1] Wildfire smoke emissions are excluded since they are caused by natural events.

Given the relatively small quantities of pollutants emitted and the large area over which these sources would be located, planning area cumulative impacts would not be expected to exceed the NAAQS for any pollutant.

Although air quality monitoring data show that ambient air quality is good through the region, cumulative future development throughout the region could result in substantial emission increases. Nearby regional oil and gas activities occur in eastern Montana, eastern Wyoming, and the Bakken area of North Dakota. Activity levels are rapidly increasing in the Bakken field, primarily located in North Dakota.

Regional air quality modeling can predict cumulative impacts to ambient concentrations and to AQRVs. However, due to insufficient data, regional modeling has not yet been performed. Regional modeling requires comprehensive emission inventories that include emissions from large sources that have been issued air quality permits by state air quality agencies and emissions from smaller unpermitted sources (such as many oil and gas sources). A comprehensive regional oil and gas emission inventory is being developed for the Williston Basin, which encompasses oil and gas activity in eastern Montana and western North and South Dakota. As explained in the ARMP in Appendix S, regional photochemical grid modeling will be performed when adequate emission and ambient air quality monitoring data are available for the region. This modeling will predict cumulative impacts to ambient concentrations of ozone and other criteria air pollutants. The modeling will also predict impacts to AQRVs, including impacts to nitrogen and sulfur deposition, lake acidification, and visibility.

Cumulative Impacts under Alternative A (Current Management)

As shown in Table 4-14, Alternative A has the greatest cumulative emissions of VOCs and HAPs, though these emissions are not much greater than those for the other alternatives. Due primarily to lower levels of prescribed burning, Alternative A has lower emissions of CO, SO_2, PM_{10}, and $PM_{2.5}$ than the other alternatives.

Cumulative Impacts under Alternative B

As shown in Table 4-14, Alternative B has greater cumulative emissions of CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$, and HAPs than Alternative A. In contrast, Alternative B VOC emissions are slightly less than those for Alternative A. When total planning area and regional emissions are considered, differences between the cumulative air quality and AQRV impacts under Alternatives A and B are negligible.

Cumulative Impacts under Alternative C

As shown in Table 4-14, Alternative C has the lowest cumulative emissions of NO_x, VOCs, and HAPs compared to the other alternatives. When total planning area and regional emissions are considered, differences between the cumulative air quality and AQRV impacts under Alternatives A, B, and C are negligible.

Cumulative Impacts under Alternative D (Preferred Alternative)

Cumulative emissions under Alternative D would be identical to those for Alternative B.

Climate Change

Proposed management activities would cause GHG emission increases from many types of sources. This section quantifies GHG emissions for each alternative and provides a qualitative discussion of potential climate impacts. As described in Chapter 3, climate change is occurring and will continue to occur for many years due to the longevity of GHGs that are already in the atmosphere. Approximate atmospheric lifetimes for CO_2, CH_4, and N_2O are 50–200 years, 12 years, and 120 years, respectively (EPA 2010). Consequently, GHG emissions would cause long-term climate change impacts.

Assumptions and Guidelines

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 that Earth radiates back into space. Although atmospheric GHG concentrations and climatic conditions have varied throughout Earth's history, recent industrialization and combustion of fossil fuels have caused global atmospheric CO_2 concentrations to increase dramatically (NRC 2006). Global atmospheric CO_2 concentrations are expected to exceed 400 parts per million (ppm) by 2020 and may plateau at 450 ppm if emissions are stabilized at current or reduced levels (USGCRP 2009). In 2008, CO_2 concentrations were 385 ppm.

The global increase in CO_2 concentrations is due primarily to fossil fuel use and land use change, while increases in CH_4 and N_2O concentrations 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, USGCRP 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 U.S. 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 CO_2, 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 following changes.

- ***Surface temperature:*** Temperatures may rise 3–5° Fahrenheit from the 1960 to 1979 baseline years by the mid-21st century (USGCRP 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 (USGCRP 2009).

- ***Precipitation:*** Regional precipitation is expected to increase during winter and spring, decrease during summer, and remain relatively stable during fall (USGCRP 2009).
- ***Annual runoff:***
  - ***Median runoff*** – Predicted median runoff for 2041–2060 compared to 1902–1970 is expected to decrease 2–5 percent in the region.
  - ***Mountain snowpack*** – The IPCC predicted with "high confidence" that "water supplies stored in mountain snowpacks would decline around the world, reducing water availability in regions supplied by meltwater (IPCC 2007).

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 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 temperature-sensitive 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, especially 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 2012). Higher temperatures are 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 (USGCRP 2009). Rapid spring snowmelt due to sudden and unseasonal temperature increases could also lead to greater erosive events and unstable soil conditions.

Increasing temperatures could affect 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 events are predicted to become less frequent. 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.

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 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 wildfire risk by increasing summer moisture deficits (USGCRP 2009). Studies have shown that earlier snowmelts can lead to a longer dry season, which increases the incidence of landscape-level fire (Westerling et al. 2006). 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 (NPS 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 (NPS 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. 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.

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 2010). Major challenges are projected for crops that are near the warm end of their suitable range or that depend on highly utilized water resources.

The lack of scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change even at local scales limits the ability to quantify current and 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 site-specific analysis of the impacts of a proposed activity on GHG and the site-specific impact from climate change. The U.S. 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 CO_2, longer growing seasons, higher heat, and more unpredictable rain patterns.

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 http://www.globalchange.gov/ and the Intergovernmental Panel on Climate Change (http://www.ipcc.ch/).

Impacts Common to All Alternatives

GHG Emissions

Due to 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 emissions that would be directly emitted from sources related to energy development, bentonite mining, fuels management , resource road maintenance, BLM travel, forest and woodland treatments, vegetation treatments, and livestock grazing. Carbon black emissions were not estimated due to the lack of carbon black emission factors.

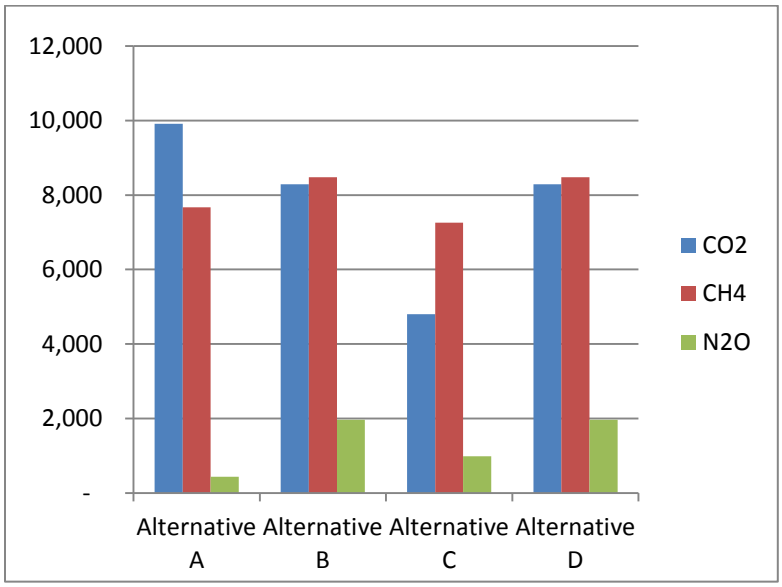
The emission estimates reflect GHG emissions from BLM-authorized activities occurring within the planning area. GHG emissions from activities outside the planning area were not included because insufficient data exist to accurately quantify these emissions. For example, combustion emissions associated 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 wildfire were not included in the emission inventories because these emissions would be beyond BLM's control and occur every year, though 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 ARTSD (BLM 2013).

GHG emission sinks due to sequestration and changes in land use were not estimated due to insufficient data and methodologies for estimating carbon uptake in vegetation and soils. BLM activities that improve forest and vegetation health would tend to increase CO_2 uptake from the atmosphere and reduce atmospheric concentrations. Increased carbon sequestration on land or subterranean areas 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 given in terms of mtpy in order to compare Alternative emissions with other GHG inventories.

Potential GHG emissions from BLM sources are shown in Figure 4-5 in terms of CO_2e given in mtpy. Under each Alternative, oil and gas activities would emit the greatest quantities of CO_2, livestock grazing would emit the greatest quantities of CH_4, and fire management would emit the greatest quantities of N_2O.

Figure 4-5
GHG Emissions in Terms of CO_2e (mtpy) for Each Alternative



GHG Emission Mitigation

GHG emissions from multiple activities would likely decrease in future years due to federal regulation of VOCs. EPA's August 16, 2012 NSPS and NESHAP final rule is expected to decrease national CH_4 emissions from affected oil and gas systems by approximately 26 percent (GPO 2012). A previous light-duty vehicle regulation imposed CO_2 emission standards for new vehicles. As new vehicles replace existing vehicles, CO_2 emissions will decline on a per-mile basis. EPA is collecting GHG emission data and is considering additional future regulation.

Climate Change Impact Mitigation

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, scientific-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 (USDI 2010). The North Central Climate Science Center, which will incorporate the planning area, was established in 2011.

Given the broad spatial influence of climate change which requires response at the landscape-level, the DOI 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 DOI, including setting a baseline and reduction goal for the Department's GHG emissions and energy use. More information about DOI's efforts to respond to climate change is available at http://www.doi.gov/whatwedo/climate/cop15/index.cfm.

Impacts from Other Resources

Air Quality: In addition to emissions of GHGs that are regulated by EPA 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 or ice, 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 CO_2, CH_4, N_2O, and black carbon from many types of sources including oil and gas equipment and operations, vehicles, and many types of engines.

Fire Management and Ecology: 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 contains large quantities of CO_2 and black carbon. In addition to emissions from smoke, vehicle and equipment exhaust emissions contribute small amounts of CO_2 and N_2O to the atmosphere.

Fluid Minerals: Oil and gas development and production activities in the planning area would increase GHG emissions, particularly emissions of CO_2 and methane. Black carbon emissions from diesel engine particulate emissions and from fugitive dust would also result from fluid minerals activity.

Livestock Grazing: Livestock grazing releases large quantities of CH_4, which is approximately 21 times more potent than CO_2 in terms of global warming potential (according to EPA regulations). CH_4 has a short atmospheric lifetime of 12 years.

Recreation: GHG emissions from recreational activities are caused primarily by vehicle emissions of CO_2 and N_2O.

Soil Resources: Soil management occurs as an integral part of many activities, including oil and gas development, road maintenance, mining, fire management, forestry management, livestock grazing, and vegetation management. CO_2 is stored in soil and in plant mass (foliage and roots). Activities that disturb soil and remove vegetation can release soil CO_2 into the atmosphere and reduce future CO_2 sequestration in plant matter. However, once site reclamation occurs and new vegetation is planted, CO_2 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 CO_2 emissions from soil or plant matter. Methods for accurately estimating soil and plant matter CO_2 releases to the atmosphere and uptake from the atmosphere are not available.

Solid Minerals: Bentonite mining is the largest solid mineral mining activity within the planning area and it is expected to continue at rates similar to those experienced in the past. This activity would contribute to the generation of GHG emissions associated with exhaust from vehicles and equipment.

Travel Management: Vehicle travel, road maintenance activities, and OHV use would cause exhaust emissions of CO_2 and N_2O.

Vegetative Communities: Vegetation treatments improve overall land health and may increase long-term soil and vegetative uptake of CO_2 from the atmosphere. However, short-term increases in CO_2 and N_2O emissions from equipment exhaust would occur during vegetation management activities. Short-term decreases in CO_2 uptake may also occur if vegetation is removed during treatment activities.

Wildlife and Special Status Species: 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.

Forests and Woodlands: Short-term vehicle exhaust emissions would occur while woodland treatments are in progress. CO_2 emissions would increase if woodland slash is burned.

Lands and Realty: New rights of way (ROWs) 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.

Impacts under Alternative A (Current Management)

Alternative A would cause estimated CO_2e emissions of 18,016 mtpy. These emissions would be less than those for Alternatives B or D and greater than those for Alternative C. Resource-specific emissions are provided in Table 4-20.

Table 4-20
BLM Source GHG Emissions under Alternative A (Current Management)

	(Tons/Year)				*(mtpy)*
Resource	***CO_2***	***CH_4***	***N_2O***	***CO_2e***	***CO_2e***
Oil and Gas Development and Production					
Oil	8,039	46	0	9,029	8,191
Natural Gas	2,068	19	0	2,459	2,231
Coalbed Natural Gas	178	5	0	286	259
Bentonite Mining	157	0	0	157	143
BLM Travel	42	0	0	44	40
BLM Road Maintenance	1	0	0	1	1
Fire Management [1]	75	10	1	744	675
Forestry Management	347	0	0	349	316
Livestock Grazing	18	322	0	6,788	6,159
Vegetation Management	2	0	0	2	2
BLM Emission Total	**10,925**	**403**	**2**	**19,859**	**18,016**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

Impacts under Alternative B

Alternative B would cause the greatest CO_2e emissions, with estimated CO_2e emissions approximately 4 percent greater than Alternative A emissions. Resource-specific emissions are provided in Table 4-21.

Table 4-21
BLM Source GHG Emissions under Alternative B

	(Tons/Year)				*(mtpy)*
Resource	***CO_2***	***CH_4***	***N_2O***	***CO_2e***	***CO_2e***
Oil and Gas Development and Production					
Oil	6,446	37	0	7,240	6,568
Natural Gas	1,873	16	0	2,204	2,000
Coalbed Natural Gas	178	5	0	286	259
Bentonite Mining	157	0	0	157	143
BLM Travel	42	0	0	44	40
BLM Road Maintenance	1	0	0	1	1
Fire Management [1]	75	48	7	3,215	2,916
Forestry Management	347	0	0	349	316
Livestock Grazing	18	340	0	7,148	6,485
Vegetation Management	2	0	0	2	2
BLM Emission Total	**9,138**	**445**	**7**	**20,646**	**18,730**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

Impacts under Alternative C

Alternative C would have the lowest CO_2e emissions. Under Alternative C, CO_2e emissions would be approximately 30 percent less than Alternative A, B, or D emissions. Resource-specific emissions are provided in Table 4-22.

Table 4-22
BLM Source GHG Emissions under Alternative C

	(Tons/Year)				*(mtpy)*
Resource	***CO_2***	***CH_4***	***N_2O***	***CO_2e***	***CO_2e***
Oil and Gas Development and Production					
Oil	3,481	21	0	3,924	3,560
Natural Gas	995	9	0	1,179	1,079
Coalbed Natural Gas	178	5	0	286	259
Bentonite Mining	157	0	0	157	143
BLM Travel	42	0	0	44	40
BLM Road Maintenance	1	0	0	1	1
Fire Management [1]	75	24	3	1,645	1,493
Forestry Management	347	0	0	349	316
Livestock Grazing	18	322	0	6,788	6,159
Vegetation Management	2	0	0	2	2
BLM Emission Total	**5,295**	**381**	**3**	**14,375**	**13,041**

[1] Excludes smoke emissions from wildfires, but includes smoke emissions from prescribed fires.

Impacts under Alternative D (Preferred Alternative)

Alternative D CO_2e emissions would be the same as emissions for Alternative B.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Climate change is the result of global GHG and black carbon emissions and global atmospheric concentrations of these pollutants. Due to transport across long distances and long atmospheric lifetimes, GHGs emitted in the planning area would contribute to global, local, and regional climate change. Black carbon emitted in the planning area would also contribute to climate change, though it remains in the atmosphere for a much shorter time than GHGs. Black carbon absorbs heat when suspended in the atmosphere and reduces albedo, the ability to reflect sunlight, when deposited on snow and ice. Climate change impacts occur on global, regional, and local levels.

Cumulative Impacts under Alternative A (Current Management)

When including GHG emissions from BLM-authorized activities and oil and gas activities on non-BLM mineral estate, cumulative CO_2e emissions under Alternative A would be 57,490 mtpy. These emissions would constitute a very small contribution to South Dakota, U.S., and global GHG emissions. Alternative A cumulative CO_2e emissions would be less than 0.18 percent of South Dakota emissions, 0.001 percent of U.S. emissions, and 0.00012 percent of global emissions.

Cumulative Impacts under Alternative B

When including GHG emissions from BLM-authorized activities and oil and gas activities on non-BLM mineral estate, cumulative CO_2e emissions under Alternative B would be 58,202 mtpy. Though slightly larger than Alternative A cumulative GHG emissions, Alternative B emissions would still constitute a very small contribution to South Dakota, U.S., and global GHG emissions.

Cumulative Impacts under Alternative C

When including GHG emissions from BLM-authorized activities and oil and gas activities on non-BLM mineral estate, cumulative CO_2e emissions under Alternative B would be 52,509 mtpy. Since they would be slightly less than Alternative A cumulative GHG emissions, Alternative C would contribute less GHG emissions to South Dakota, U.S., and global GHG emissions.

Cumulative Impacts under Alternative D (Preferred Alternative)

Cumulative CO_2e emissions under Alternative D would be identical to those for Alternative B.

Soil Resources

Assumptions

The BLM manages soils for resource values (e.g., vegetative productivity and watershed health) and resource uses (e.g., livestock grazing). Potential impacts to soils in the planning area were evaluated to consider changes to short- and long-term resource values and uses.

For this broad-scale analysis, the primary indicator of potential effects to soils is the number of acres of surface disturbance caused by allowable uses and management actions on BLM-administered land (Table 4-23). Correlating proposed surface disturbances and alternative management themes with the BLM's datasets (utilized by ESRI's ArcGIS Desktop 9.3 computer software) enables the effects on soil resources to be described qualitatively and, where possible, quantitatively.

Table 4-23 Short-Term Surface Disturbance on BLM-Administered Surface – 20 Year Period* (Acres)				
	Alternative A (Current Management)	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
Range Improvements	160	160	160	160
Mechanical Forest Treatments	484	560	490	560
Prescribed Fire (Forest and Grassland)	92	400	200	400
Oil and Gas Development	82	65	37	65
Renewable Energy	924	768	311	520
Rights-of-Way	136	133	88	133
Gold/Silver Mining	1	1	1	1
Bentonite Mining	87	87	87	87
Total	**1,966**	**2,174**	**1,651**	**2,290**
Percent of BLM-Administered Surface	**0.7%**	**0.8%**	**0.6%**	**0.8%**

*Short-term disturbance includes all acres that are disturbed, including acres that may be reclaimed.

Long-term surface disturbance (Table 4-24) was determined by subtracting reclaimed acres from short-term disturbance.

Table 4-24 Long-Term Surface Disturbance on BLM-Administered Surface – 20 Year Period* (Acres)				
	Alternative A (Current Management)	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
Range Improvements	6	6	6	6
Fuel/Forestry Treatments	1	1	1	1
Oil and Gas Development	49	39	22	39
Renewable Energy	231	192	78	130
Rights-of-Way	79	77	51	77
Gold/Silver Mining	1	1	1	1
Bentonite Mining	9	9	9	9
Total	**376**	**325**	**237**	**354**
Percent of BLM-Administered Surface	**0.1%**	**0.1%**	**0.1%**	**0.1%**

*Long-term disturbance includes areas that are permanently disturbed or altered. Long-term disturbance does not include areas that are reclaimed.

Of particular importance is surface disturbance to sensitive soils and soils in areas with steep slopes (greater than 25 percent). The distribution of soils susceptible to adverse effects is summarized in Table 4-25.

Table 4-25 At-Risk Soils in the Planning Area (Acres)			
	***Sensitive Soils**[1]*	***Slope >25%***	***Floodplains (Flooded Soils)***
BLM Surface	39,230	14,061	13,397
Federal Oil and Gas Subsurface	268,414	62,890	63,426

*Includes soils classified by NRCS as having low fugitive dust resistance and/or low restoration potential.

Flooded soils (NRCS flooded soils dataset – see Glossary) are soils that are flooded for rare, long, or very long duration during the growing season. They are indicative of wetlands, floodplains, and riparian areas and are also considered to be at risk. However, because potential impacts to these soils have a greater bearing on water quality, flooded soils/floodplains are discussed under the Water Resources section (see Table 4-25 for acres susceptible to flooding). Potential effects to soils from implementation of the various alternatives are similar; however, the amount of potentially disturbed acreage is anticipated to vary by specific allowable uses and management actions associated with individual alternatives, as described below.

Soil Map Units (SMUs) may be determined by multiple methods, but generally represent soils or groups of soils that share common characteristics such as texture, slope, organic content, and moisture. For analysis purposes, if an SMU has low restoration potential, then the entire SMU is rated as such. However, there could be areas within the SMU that may have a slight or moderate rating. These areas may be exceptions from soil NSO and Controlled Surface Use (CSU) restrictions if the Authorized Officer determines that the proposed activity would not contribute to degradation of the soil resource. No detrimental impacts would be expected; however, by granting an exemption to the NSO or CSU restriction, the possibility of adversely impacting soils would still exist.

Short-term effects to soils are effects that result from initial surface disturbance prior to stabilization by vegetation or practices/structures that minimize water and wind erosion. Long-term effects due to accelerated erosion (loss of soil productivity and available soil resources) would occur in locations where bare soils are allowed to remain exposed to water and wind for more than five years. Other long-term effects are partly from changes in vegetative communities and the loss of productivity where facilities and structures are built and the soil profile is altered or removed.

Indirect effects to disturbed soils include: 1) sedimentation of drainages and perennial water bodies primarily by water or wind erosion; 2) particulate matter affecting air quality through wind erosion; 3) reduced infiltration; 4) an increase in surface water runoff that could cause higher peak stream flows and possibly downstream flooding; and 5) changes in surface water quality caused by exposing soils or bedrock with undesirable chemical characteristics (e.g., high salinity, naturally-occurring constituents of concern).

Impact analysis and conclusions are based on interdisciplinary team knowledge of resources within the planning area, review of existing literature, and information provided by other agencies and public land users. Effects are quantified where possible. In the absence of quantitative data, best professional judgment was used. Impacts are sometimes described using ranges of potential impacts or in qualitative terms, as appropriate.

The following assumptions were made during evaluation of potential impacts to soils:

Reclamation would effectively mitigate long-term oil and gas construction impacts.

Livestock grazing would have no long-term impact if properly managed under the Standards for Rangeland Health and Guidelines for Livestock Grazing Management (Appendix A).

Livestock grazing causes minimal small-scale surface disturbance when properly managed.

Surface-disturbing activities would affect soils to varying degrees depending on the type of disturbance, amount, and location; soil and vegetation type; time of year; climatic factors; and surface hydrology. Surface-disturbing activities remove protective vegetative cover and/or crusts and can alter physical, chemical, and biological soil properties; resulting in

increased soil susceptibility to water and wind erosion and decreased soil quality and site productivity. For example, increasing the amount of bare ground at the expense of vegetation and microbiotic activity decreases the ability of a soil to soak up precipitation and increases runoff, erosion, and soil loss (Jadczyszyn and Niedzwiecki 2005). Areas where soils have severe erosion hazards, poor reclamation suitability, badlands, and rock outcrop are the most vulnerable to these types of effects.

All soils are susceptible to accelerated erosion. Accelerated erosion is defined as erosion that is in excess of natural erosion rates and occurs when soil particles are detached and removed as a result of human and/or animal activities. Sensitive soils, of which soils with low fugitive dust resistance are a component, and soils on steep slopes, are most vulnerable respectively to accelerated wind and water erosion. Once disturbed, it is difficult and costly to stabilize these areas. Accelerated erosion is approximately seven times greater on soils with a severe erosion hazard than predicted for soils with a low or moderate erosion hazard (USFS 2010b).

Soil compaction results from equipment, vehicles, humans, and animals traveling over trails, roads, and land. Compaction severity depends on soil type, soil moisture, vegetative cover, and the frequency and weight (lbs./sq. inch) of the animal or vehicle. Soils are most susceptible to compaction during moist conditions. Floodplain soils would be subject to rutting and compaction (see Table 4-25 for acres susceptible to flooding). Compaction alters soil structure reducing infiltration/permeability rates and in turn increases runoff, erosion, and potential sedimentation and decreases vegetative vigor, water quality, and productivity.

Important soil components often affected by surface-disturbing activities are biological, chemical, and physical crusts. Biological soil crusts are an intimate association between soil particles and cyanobacteria, algae, microfungi, lichens, and bryophytes, all of which live within or on top of the uppermost millimeters of soil (Rosentreter, et al. 2007). Chemical and physical crusts are inorganic features such as a salt crust or platy surface crust (USGS 2006). These crusts (biological and chemical/physical) hold soil particles in place to help stabilize soils reducing erosion and increasing soil quality. Crusts can be completely damaged, destroyed, or removed by repeated foot and/or vehicle traffic or any other surface-disturbing activities. Once these disturbances occur, the erosive powers of water and wind can easily erode exposed soil particles.

Badland Formations, Harding County BLM Photo

Impacts Common to All Alternatives

The following key soil concepts are fundamental to understanding potential effects to soil quality and soil/site stability.

> "Soil quality is the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, sustain plant and animal productivity, maintain or enhance the quality of water and air, and support human health and habitation. Changes in the capacity of soil to function are reflected in soil properties that change in response to management or climate. Changes in soil quality that occur as a result of management affect:
>
> - the amount of water from rainfall and snowmelt that is available for plant growth;
> - runoff, water infiltration, and the potential for erosion;
> - the availability of nutrients for plant growth;
> - the conditions needed for germination, seedling establishment, vegetative reproduction, and root growth; and
> - the ability of the soil to act as a filter and protect water and air quality" (USDA-NRCS 2001).

Achieving or maintaining Standards for Rangeland Health would maintain or promote adequate amounts of ground cover (litter, live and standing dead vegetation, microbiotic crusts, and rock/gravel), plant vigor, subsurface soil conditions that support permeability rates, soil biological organisms, nutrient cycling, and riparian and wetland functions. This would reduce soil compaction, runoff, erosion, and sedimentation and improve overall soil health.

Oil and gas stipulations and surface restrictions (rights-of-way, etc.) would restrict the types and locations of surface-disturbing activities to varying degrees under all alternatives.

Air Quality: Air pollutant emissions of nitrogen- and sulfur-containing compounds, primarily from engine and vehicle sources, could affect soil quality by contributing to a negligible increase in soil acidity. Pollutant contributions would be greater during periods of well drilling and during facility and infrastructure construction when large non-road engines are operating and when high vehicle traffic occurs. Pollutant contributions would be lower when high-intensity activities are not occurring.

Climate: Long-term climate change could affect soil resources, both beneficially and adversely. Temperature increase has been correlated with faster rates of decomposition and decline of soil organic matter content (Kirschbaum 1995). Decomposition benefits soil productivity by releasing nutrients such as nitrogen. Although healthy rangeland soils tend to have higher organic content, there is no direct quantitative relationship between soil productivity and organic matter content (AAFRD 2001). Secondarily, because organic matter contributes to soil structure and resistance to erosion, decreased organic matter content could also have separate adverse impacts on soil resources. Soil microorganisms and invertebrates would tend to change, with climate change, and would likely have slightly fewer species until more adapted species migrate into the soil.

Cultural Resources: Excavations during cultural resource investigations would have moderate adverse impacts to very small areas of BLM-administered surface, and would have inconsequential effects on the scale of the RMP. Avoiding cultural resources, as directed by management decisions, would have protective effects on soil resources, as would acquisition of significant cultural resource properties and listing qualified sites on the National Register of Historic Places (NRHP).

Invasive Species, Including Noxious Weeds: Treatments to control invasive and noxious weeds could result in short-term, localized, adverse effects to soil stability because vegetation may be removed making soil susceptible to erosion. Since invasive and noxious weeds can impact soil function and reduce biodiversity, controlling invasive and noxious weed species would be beneficial to soil quality if treatments result in increased native plant cover on sites degraded by weedy vegetation. Many invasive and noxious weeds have relatively sparse canopies, which result in less surface protection and greater amounts of erosion compared to native vegetation (BLM 2007c).

Paleontological Resources: Individual paleontological investigations would affect a small area ranging from 1/4 acre to five acres and would occur infrequently (once every one to five years). Excavations during paleontological resource investigations would have moderate impacts to minor areas of BLM-administered surface. Avoiding paleontological

resources, as directed by management decisions, would have protective effects resulting in beneficial impacts on soil resources. The withdrawal and closure of minerals, as well as NSO lease stipulations will protect soil resources in the Fossil Cycad ACEC.

Vegetative Communities: Managing for healthy vegetative communities would help to achieve or maintain Dakotas Standards for Rangeland Health (Appendix A). Achieving or maintaining Proper Functioning Condition (PFC) on upland sites promotes adequate amounts of vegetative cover to stabilize soils and provide organic material and nutrient cycling. As described in the Montana and Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997a), achieving or maintaining PFC in riparian areas promotes the growth of deep-rooted riparian vegetation that dissipates streamflow energy, stabilizes streambanks from cutting action, and filters sediment. Monitoring uplands and riparian areas for PFC would provide information needed to implement appropriate mitigation measures (if necessary) to protect soil resources.

From a grazing standpoint, maintenance of adequate plant cover and vigor in grazed areas would be addressed in two ways. A 50 percent livestock forage utilization limit would be used to maintain adequate cover and plant vigor to protect soils. Secondly, a vegetation allocation that would apportion 25 percent of vegetation production to livestock and 75 percent to meet wildlife and watershed needs would ensure that rangelands are stocked at conservative levels and excessive vegetation is not removed by livestock (NRCS 1997). At the Fort Meade Recreation Area ACEC, under all alternatives, 8 to 12 inches of residual herbaceous growth would be maintained on 50 percent of the uplands needed for ground-nesting birds. Maintaining constant vegetation levels would provide additional protection for soil resources.

Effects of mechanical treatments on soils would depend on the following: 1) the amount of soil exposed during treatment; 2) the effect of ground disturbance on soil properties; 3) site conditions, especially slope and patterns of precipitation; and 4) the vegetation response after treatment (BLM 2007c).

Utilizing native seed species as the preferred method of vegetation restoration would contribute to the long-term stability of vegetative communities and soil quality under all alternatives. In addition, non-invasive species would be introduced to restore vegetation when emergency rehabilitation is needed to control erosion where re-establishment of native vegetation on problematic soils is unlikely or where severe loss of topsoil has occurred.

Water Resources: In general, management decisions designed to protect surface water and groundwater resources would also be beneficial to soil resources. Under all alternatives, areas of flooded soils, which serve as a proxy for floodplains and wetlands for the water resources section, would be subject to NSO lease stipulations. BLM-administered lands with CSU stipulations on construction in areas of steep slopes and sensitive soils are summarized in the Water Resource Section.

Fire Management and Ecology: Wildland fire management actions would create greater initial impacts to soils than other resource management actions and resource uses (Tables 4-23 and 4-24). Actual acres disturbed by mechanical treatments would range from 484 to 560 acres, depending on alternative, over the life of the SD RMP. This range represents a maximum disturbance of approximately 0.2 percent of the BLM's land base in South Dakota. Actual acres disturbed by prescribed fire would range from 92 to 400 acres, depending on alternative, over the life of the SD RMP. This range represents a maximum disturbance of approximately 0.04-0.14 percent of the BLM's land base in South Dakota. Prescribed fire and wildfires cause short-term, localized runoff; soil erosion; and sedimentation. Factors such as intensity, duration, soil moisture, vegetation type, fuel type and density, and time of year determine the severity of impacts on physical, chemical, and biological soil properties. As vegetation recovers, impacts diminish. Recovery from initial impacts typically occurs within one to five years, except in areas where there is high burn severity, resulting in minimal effects to the long-term productivity of a site. Soil impacts are typically less severe from prescribed fire than from wildfire. Prescribed fire ignitions can be controlled to times of year when there would likely be less damage to soils from excessive heating. Prescribed fires reduce fuel loading, minimizing the risk of catastrophic wildfires; therefore, short-term impacts associated with prescribed fire generate long-term benefits by reducing the risk of highly damaging catastrophic wildfires. Off-road use of heavy equipment and other vehicles to implement fire management activities can create impacts to soils similar to other travel activities, such as soil and vegetation disruption, rutting, and compaction. Mechanical treatments may have longer lasting localized effects than prescribed fires; see Vegetation section, above.

Implementation of prescribed burning, mechanical treatments, or other appropriate methods used to restore desired ecological conditions of rangelands, forests or woodlands would improve soil and vegetation quality in the long term. The

use and movement of heavy equipment for fire suppression would occur in all areas unless prohibited by restrictions or special designations. Precautions to protect other resources during wildfire management would also minimize soil erosion.

Soil quality would benefit from implementation of emergency stabilization and rehabilitation treatments because these treatments stabilize and prevent unacceptable degradation to natural resources such as fire-damaged lands unlikely to recover naturally. When fires do occur, burned area emergency response (BAER) assessments would be carried out to evaluate soil impacts and recommend appropriate remediation. Treatments would be in accordance with the BLM Burned Area Emergency Stabilization and Rehabilitation policy (BLM Handbook H-1742-1). Without these actions, soils would be susceptible to erosion and long-term degradation, indirectly creating an adverse effect on other resources and uses that are dependent on stable, productive soils.

Wildlife and Special Status Species: Management decisions to protect designated threatened or endangered plant and wildlife species under the Endangered Species Act (ESA) or species in the planning area considered sensitive by the BLM would have protective effects on soil resources. Generally, restrictions on the type, location, or time period certain activities are permitted would also decrease disturbance of soils and vegetation. For example, establishing NSO buffers around sage-grouse and greater prairie-chicken leks or restricting surface disturbance within nesting and brood-rearing habitat would limit the amount of surface disturbance to all soil types in those areas. Acres of wildlife resources are presented throughout the alternatives in Table 4-28. Species such as bald eagle, piping plover, least tern, and peregrine falcon do not nest directly on BLM-administered surface at this time. Prairie dog colonies often create minor to moderate short- and long-term adverse impacts to soil resources by degrading vegetative cover and exposing soils to erosion. Timing restrictions designed to protect wildlife values would not ultimately result in beneficial or adverse impacts to soil quality because the restricted activities would happen at other times of the year and would have similar impacts to soil resources.

Forest and Woodland Products: Disturbance associated with forest treatment activities (logging, planting, chemical treatments) would generate accelerated soil erosion in the short term and could increase soil compaction within treatment areas. All lands in the planning area would be available for sale, use and treatment of forest products, except sale would not be allowed on the Fossil Cycad ACEC. Only between 484 and 560 acres out of 274,000 acres would be disturbed during the life of the SD RMP. This range represents a maximum disturbance of approximately 0.2 percent of the BLM's land base in South Dakota. Effects are greatest on roads and skid trails. Not every acre within a harvest unit would be impacted. The acreage represented is the "unit boundary" which actually presents the worst case scenario. Silvicultural prescriptions (an operational plan that describes forest management objectives for an area) and contracts containing mitigation measures would be written to include, but would not be limited to, those specified in the Forestry BMPs of South Dakota (SDDA 2003). These measures would provide protection to soil resources and decrease relative levels of soil impacts. Because BMPs may not be implemented properly at all times, the potential for direct adverse impacts to soils is expected to be proportional to the probable timber sale quantity and amount, type, and location of road construction. Temporary roads could be established to conduct forest or woodland treatments or for other multiple use reasons.

Lands and Realty: ROWs would be avoided where soil erosion cannot be effectively controlled or mitigated and reclamation to BLM program standards is likely unsuccessful (example: floodplains (flooded soils), steep slopes, sensitive soils). Soil-specific protective avoidance measures would maintain soil quality and minimize site degradation. ROWs would also be restricted from other areas to protect threatened, endangered, or sensitive plant and wildlife species. Only 88 to 136 acres out of 274,000 total acres would be disturbed over the life of the SD RMP. This range represents a maximum disturbance of approximately 0.03-0.05 percent of the BLM's land base in South Dakota. Short-term impacts would include more sedimentation and increased runoff from disturbed soils. In the long term, 51 to 79 acres out of 274,000 total acres would remain impacted. This range represents a maximum disturbance of approximately 0.02 percent of the BLM's land base in South Dakota. Long-term impacts would include compaction, sediment, and increased runoff from permanent roads.

Livestock Grazing: Livestock tend to compact soils where trampling, trailing, and congregation occur. Water or wind erosion of soils may be accelerated if insufficient litter or plant cover is left after the grazing season or if plant composition is altered by grazing practices. Soil structure can be adversely affected by livestock grazing if biological or physical soil crusts are damaged. Overgrazing can reduce the amount of organic matter, carbon storing ability, and kinds and numbers of microorganisms living in soils. Potential impacts to soil resources can be qualitatively evaluated by the amount of land available to grazing and the number of Animal Unit Months (AUMs) available for forage on those lands.

Achieving or maintaining Standards for Rangeland Health and Guidelines for Livestock Grazing Management are generally effective in managing potential adverse effects to soils from livestock grazing. Adjustments to grazing authorizations are made on a case-by-case basis when site-specific studies indicate changes in management are needed.

However, according to BLM rangeland health assessments completed since 2004, approximately 4,500 acres of the 260,000 acres assessed within the planning area did not meet Standards for Rangeland Health as a result of livestock grazing (BLM 2010b). Corrective management actions have been implemented on all grazing allotments that did not meet the Standards. Reassessment of some of the allotments not meeting Standards indicates that 3,100 acres have improved and now meet the Standards, leaving 1,400 acres still not meeting Standards due to livestock grazing. This suggests that 0.5 percent of the BLM's soil resources in South Dakota may be adversely impacted by livestock grazing.

Constructing/installing range improvement projects such as livestock reservoirs, pits, pipelines, and tanks would result in short-term, localized compaction and soil erosion. This construction is anticipated to create minor long-term adverse impacts to soils. Under all alternatives, approximately 4.7 miles of fence and 1.1 miles of pipeline are anticipated to be constructed annually and one water pit/reservoir every other year on BLM land in the planning area.

Overall, livestock grazing would have a net minor beneficial short- and long-term impact to soils through continued implementation of the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management for all alternatives. Assessed upland health sites and riparian areas would be expected to continue making significant progress toward meeting the Standards.

Minerals – Fluid: The BLM administers approximately 1.7 million acres of federal oil and gas estate within the planning area. Fluid minerals (hydrocarbon oil and gas) are considered to have high potential for RFD on approximately 113,500 federal mineral acres within the planning area and moderate RFD potential on approximately 80,500 additional acres. Fluid mineral development would affect soils and vegetation during exploration, drilling, production, and abandonment. Between 37 and 82 acres, out of 274,000 acres on BLM surface, would be affected in the short term. This range represents a short-term disturbance of approximately 0.03 percent of the BLM's land base in South Dakota. Effects could include vegetation removal, soil exposure, mixing of soil horizons, loss of topsoil productivity, soil compaction, and increased susceptibility to water and wind erosion. Site-specific mitigation measures, BMPs, and reclamation standards would be implemented and monitored to minimize potential adverse effects. The Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development "The Gold Book" (USDI-BLM 2007b) would be followed by operators. Effects would be both short-term (well pads and pipelines) and long-term (production areas and access roads). Production areas and access roads would remain nonproductive and would continue to be at risk of erosion until abandonment and final reclamation. Between 38 to 49 acres, out of 274,000 acres on BLM surface, would be affected in the long term. This range represents a long-term disturbance of approximately 0.02 percent of the BLM's land base in South Dakota

Reclamation is not normally a problem on drill pads (Munshower 1994). Areas not needed for active production and operations should undergo interim reclamation. To minimize potential adverse impacts to soil quality, reclamation measures would begin as soon as possible (interim or during drilling) after the disturbance and continue until successful reclamation is achieved. Generally, soil erosion rates are greater on recently reclaimed areas and decrease over time to natural levels in about three to five years. Production water, when spilled, could contaminate soils and vegetation (depending on properties of the water). Impact magnitudes resulting from produced water spills would be proportional to spill volume, vegetation present, composition of the produced water, and flow characteristics of the spill (fast and erosive or slow and infiltrating). Produced water spills would likely decrease vegetative cover over minor areas for short time periods, exposing soils to erosive processes.

The approximate total disturbed acreage associated with construction of well sites, access roads, and pipelines on BLM-administered surface estate and BLM mineral estate is listed in Table 4-5. Although the number of wells, extent of surface disturbance, and scope of surface use stipulations are expected to vary among alternatives, the types of impacts would be the same. Well pads and pipelines would undergo interim reclamation during production, stabilizing soils and returning productivity. A long-term commitment of soils would be required for access roads and production areas. Soil and vegetation productivity would be severely limited in those areas.

Minerals – Leasable: No impacts to soil resources are anticipated to occur from leasing coal, geothermal, or other minerals in the planning area. That said, no further geothermal development is anticipated to occur in the foreseeable future.

Minerals – Locatable: The Bentonite RFD scenario indicates that approximately 1,700 acres of mixed ownership land in Butte County has potential to be disturbed by mining or mining-related activity during the life of this RMP (Map 2-13). Of this acreage, 289 acres would likely be on BLM surface estate and 1,292 acres would be federal mineral estate. Mining claims are permitted in 20-acre parcels; however, due to local geology some portions of each claim may not contain economically valuable bentonite deposits. Under normal circumstances, 30 percent of lands claimed and permitted would actually be mined.

Following these assumptions, approximately 87 acres of BLM surface estate and 388 acres of federal mineral estate would likely be directly impacted by bentonite mining. Similarly, because approximately 27 percent of lands within the leases are expected to contain sensitive soils, approximately 23 acres of sensitive soil on BLM-administered surface estate and 104 acres of sensitive soil on federal mineral estate would be directly impacted by bentonite mining. Lands outside of mined areas may be disturbed from establishment and/or use of haul roads, equipment movement, or other activities. Approximately 9 acres (total BLM surface and mineral estate) of potential development would occur in areas where fugitive dust resistance is low.

In addition, the Shear-Clarkson Bentonite Mine was approved in 2008. The Shear-Clarkson mine project encompasses 845 total acres and includes 118 acres of BLM surface ownership and 727 acres of BLM-administered mineral estate (BLM 2008e). These acreages are expected to be the same under all alternatives.

Bentonite surface mining activities would affect soils through the removal, storage, and replacement of soils during extraction of solid minerals and construction of mining infrastructure. Soils would be compacted or disturbed by heavy equipment usage and would be at risk of erosion as a result. In some areas, soils would be completely removed to expose desired minerals; thus soil functionality at those sites would be eliminated or severely impacted until abandonment and final reclamation. Reclamation planning would be required and implemented to return soil quality and site productivity to its pre-construction condition. Reclamation efforts would occur concurrently with mining activity, and no more than 100 acres would remain exposed at any one time. The steep slopes, badlands topography, and sparse native vegetation associated with many bentonite deposits may hinder reclamation efforts. Map 2-8 displays the areas likely to be mined and includes a 1/2 mile buffer around these areas.

Short-term direct impacts to soils are expected to be major on up to 100 acres at any given time and would ultimately affect approximately 475 acres of combined BLM-administered surface and mineral estate. Major long-term impacts to soil resources are anticipated to persist on approximately 10 percent of the initially disturbed acreage (9 acres BLM surface, 39 acres BLM minerals). This is less than 0.1 percent of the BLM lands in the planning area. Moderate to minor impacts to soils from mining-related activities (particularly access road construction) are expected to occur over the short and long term. The types and magnitudes of impacts are anticipated to be the same for all alternatives.

Recreation: Recreational use could result in soil and vegetation disturbances. Resulting impacts to soil resources would depend on the duration and circumstance of use. Most disturbances would occur in areas of concentrated use such as roads, hiking trails, and campgrounds (dispersed or developed). Recreational gold panning, dispersed and developed camping, and group permits could produce small, and occasionally moderate, short-term adverse impacts to soil resources. These disturbances would likely result in localized soil compaction and erosion affecting soil and vegetation quality.

Renewable Energy: Soils and vegetation would be affected by wind, solar, biomass, and hydropower energy development. Specific soil types at a given site would be affected differently. Soil compaction and erosion would likely occur from creation or use of roads associated with renewable energy development. Soils would be removed from productivity over the long term where turbines, solar panels, and associated facilities are located. Visual Resource Management (VRM) Class II Areas, the Fort Meade ACEC, and the Fort Meade Special Recreation Management Area (SRMA) buffer area would be closed to renewable energy development under all alternatives. Therefore, no soil disturbance would occur in those areas as a result of renewable energy management activities. ROW avoidance and exclusion areas would be applied to renewable energy development under Alternatives B, C, and D while Alternative A would be open to renewable energy; protecting soils from some of the worst impacts of erosion, compaction, accelerated runoff, and decrease in soil biota. Surface use stipulations (restrictions) for all alternatives are summarized in Table 2-3 (Summary Comparison of Impacts).

Special Designations: Existing and proposed special management areas, ACECs and SRMAs, provide management constraints. These constraints all limit potential surface-disturbing activities which could prevent degradation of soil resources in and around the special management areas.

Travel Management: Travel on roads and trails could increase soil disturbance resulting in increased compaction, rutting, surface runoff, and subsequent erosion. The severity of disturbance would depend upon soil conditions (moist or wet versus dry or frozen), frequency, vehicle weight, weight distribution (pounds per square inch), vehicle type, tire width or tread, and driver type. Effects would be greatest in unmaintained or unimproved areas of concentrated use and would be mostly confined to the roadways, areas already removed from vegetative production. Soils would be adversely impacted by compaction and increased erosion. Travel through wet soil could lead to rutting and creation of alternative routes, parallel and/or braided roads or trails. Ruts provide a channel for concentrated flow, accelerating soil erosion. Off-road travel, especially in areas of concentrated use, can greatly contribute to soil compaction and increased rates of erosion. These effects are influenced by the type of vegetation or soil present, soil saturation, and type of vehicle. Impacts to vegetation and soils are more severe from off-road travel than existing roads since it directly impacts productive soil. Within the planning area, off-road or cross-country vehicular travel is typically associated with access to campsites or emergency management actions.

Under all alternatives, BLM lease/permit holders may travel cross country (off road/off highway) if such use is directly related to administration of a grazing lease or other permitted uses, provided that resource damage does not occur. The most common form of cross-country travel is travel along fence lines and occasional cross-country travel in other areas as livestock are moved from pasture to pasture and range improvements are inspected. The BLM can limit cross-country travel as a result of resource concerns such as wet periods, periods of high fire danger, potential disturbance to cultural sites, etc. Past experience in the planning area has shown that grazing lessees have been respectful of the need to discontinue cross-country travel during wet periods or periods of high fire danger, and adverse impacts have been minor in the long term. Normally, cross-country use associated with management of grazing does not result in new routes being created. An exception occurs when repeated travel to a new range improvement such as a stock tank or reservoir occurs. This is anticipated to create minor, long-term impacts to soils as the repeated travel impacts productive soils. Cross-country travel with non-grazing permitted uses is normally limited and would be limited in the future.

Currently, there is no intensive off-road interest or use in the planning area by OHV groups; however, one exception is the Exemption Area around Lead and Deadwood, South Dakota. This area includes approximately 5,100 acres of public land adjacent to the Black Hills National Forest (BHNF). Prior to the 2010 Travel Management Plan Record of Decision (ROD), the BHNF travel policy allowing unlimited motorized cross-county travel on approximately 864,000 acres encouraged high levels of OHV and motorcycle (dirt bike) use on the BHNF. The desire to access the BHNF results in travel on BLM-administered public land as users enter or leave the BHNF. The most common impact to soil resources associated with recreational OHV use in the Exemption Area and BHNF results from the proliferation of new user-created routes, which are illegal on BLM-administered surface. These routes lack drainage structures and often occur on steeper slopes rather than planned routes. Repeated travel along these routes has the potential to remove vegetation, causes soil erosion and/or compaction, and concentrates water runoff within ruts and gullies.

The Exemption Area and large blocks of public land in Butte County (Center of the Nation) have been selected as Travel Management Areas (TMAs) as part of the management common to all alternatives in this RMP. In the short term, impacts to soils are expected to be minor in all areas. Current trends of increasing recreational demands are expected to continue in the future and could result in moderate and possibly major adverse impacts to soils in both areas. As a result of future travel planning at the implementation level, combined with the detailed coordination required by this level of planning, impacts to soils are anticipated to be minor to moderate in the short and long term.

The Cheyenne River Breaks near the confluence of the Belle Fourche and Cheyenne rivers (Two Rivers area) north of Wall, South Dakota contain steep terrain that could be appealing to OHV vehicle users, but few problems have occurred as much of the BLM-administered land has little public access for vehicles. Increased access to public lands could result in increased cross-country travel and/or increased travel along existing routes that are not designed to handle intensive use. As soils are generally highly erosive in this area, seasonal road closures, road improvements, or other types of restrictions may need to be implemented if public access for vehicles is improved in this area.

BLM roads and trails that are properly designed, graded, and maintained would provide for improved road/trail conditions. This could result in decreased soil disturbances associated with creation of parallel or braided roads/trails and associated runoff and subsequent erosion. Roads/trails with poor design and improper maintenance would be the most susceptible to erosion from runoff, compacted surfaces, and lack of vegetative cover. Typically, poorly designed and improperly maintained roads become incised and channel water, leading to erosion within and adjacent to the road. Appropriate design standards that minimize surface runoff and subsequent soil erosion would be required for new roads/trails.

Roads/trails would be assigned a maintenance level with specific minimum maintenance standards/intensities for control of runoff, erosion, and sedimentation. Drainage structures would be installed or maintained as needed. Grading would be performed only where necessary to correct drainage problems and erosion or when ruts in the roadbed need to be addressed for travel comfort. This would result in an increase in vegetation within the roads and trails over time, reducing or slowing concentrated flow and stabilizing soils. In general, temporary road construction would create moderate, short-term adverse impacts to soil resources and minor, long-term adverse impacts.

Allowing for cross-country motorized travel to retrieve big game animals could create rutting and soil compaction at minor levels that could increase to moderate, long-term, adverse impacts if access points are repeatedly used or if travel occurs during periods of saturated soil conditions. Sensitive soils and soils with high site degradation potential would be most affected. Establishment of an OHV trail system near Deadwood could create similar moderate, long-term impacts to soil resources. These issues will be addressed in a travel management plan after the RMP is completed.

The Exemption Area, Center of the Nation, and Fort Meade ACEC/TMAs were identified as travel management areas; however, no site-specific route designations for these areas (open, closed, or limited) will be made in this RMP. Therefore, travel and transportation management plans that define designated motorized and non-motorized transportation networks would need to be developed after completion of this RMP. An interdisciplinary team, as well as the RMP cooperating agencies, would be used for special expertise in identifying the resource and use conflicts and benefits of various routes. Public involvement would be conducted as required through the NEPA process at the implementation level. Because route designations have not been made, impacts to soil resources are difficult to analyze. However, the interdisciplinary process is expected to help ensure that harmful impacts to soil resources resulting from travel management actions would be minor in the short and long term under all alternatives.

Impacts under Alternative A (Current Management)

Soils would be protected on fluid mineral Closed and NSO, and ROW exclusion areas because surface-disturbing activities would not be allowed. Restricting these activities would decrease potential soil loss due to erosion and maintain vegetative productivity without requiring reclamation. Areas subject to fluid mineral CSU stipulations and ROW avoidance areas would be protected from surface-disturbing activities unless it is determined that the management activity would not contribute to soil degradation. Oil and gas stipulations and ROW exclusion and avoidance areas designed to protect other resources (wildlife, water) would generally have beneficial impacts to soil resources by limiting the type, extent, and timing of surface disturbances and other potentially harmful activities.

Under Alternative A, no Closed or NSO stipulation with the specific goal of protecting soil resources would be applied. The Soils-CSU stipulation states that surface use or occupancy by oil and gas operations within special areas would be strictly controlled, or if absolutely necessary, excluded. Special areas in this case would be slopes over 30 percent, 8,575 acres of BLM-administered surface lands. Use or occupancy of soils with slopes greater than 30 percent would be restricted until the Authorized Officer has approved an engineering and reclamation plan that demonstrates how the following would be accomplished: site productivity restored; surface runoff adequately controlled; off-site areas protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting; water quality and quantity in conformance with state and federal water quality laws; surface-disturbing activities prohibited during extended wet periods; and construction not allowed when soils are frozen. If it were demonstrated that effects to soils from the proposed surface use or occupancy could not be mitigated, the Authorized Officer would have the authority to exclude surface use or occupancy. See Table 4-26.

Vegetative Communities: Under Alternative A, current management only stipulates that the use of native seeds be the preferred method of vegetation restoration. This provides a slightly lower level of protection of soil resources than under the other alternatives. Vegetation management activities are anticipated to create minor, short-term adverse impacts and moderate, long-term beneficial impacts to soils.

Water Resources: Under Alternative A, current management dictates an NSO stipulation of floodplains (flooded soils), wetlands, and riparian areas. There are no ROW restrictions. Alternative A protects fewer acres near these features as an NSO stipulation would not apply in areas within 300 feet of these features and the alternative provides no ROW restrictions on or near these features. See Table 4-27.

Fire Management and Ecology: Mechanical treatments and management activities such as prescribed fire to enhance healthy forest conditions and restore desired ecological conditions of rangelands would subject soils to localized short-term erosion and compaction effects. Meeting the desired future condition in the long term with these treatments would contribute to properly functioning watersheds that support productive plant communities and would improve soil quality in the long term. Also, on these treated acres, the risk of catastrophic wildfires would be reduced. Impacts to soils would be reduced by restricting the use of heavy equipment and off-road vehicles to existing roads and trails during rehabilitation. Heavy equipment use for mechanical treatments and other management activities would also be specifically restricted from use in riparian areas, streamside zones, and the Belle Eldridge repository. Treatments and management activities are anticipated to have moderate, adverse short-term impacts to soils due to prescribed fires and mechanical treatments. Long-term adverse impacts to soils would be minor to negligible. Moderate levels of long-term protection to soils would result from minimizing catastrophic wildfires and exposure of soils to erosion.

Table 4-26
Soil Resource Management Actions by Alternative

Management Action	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Steep Slopes				
1 - Oil and Gas stipulation	CSU: Slopes over 30% Surface: 8,575 acres Subsurface: 40,476 acres	CSU: Slopes over 25% Surface: 14,061 acres Subsurface: 62,890 acres	NSO: Slopes over 25% Surface: 14,061 acres Subsurface: 62,890 acres	CSU: Slopes 25%-50% Surface: 13,132 acres Subsurface: 59,642 acres NSO: Slopes over 50% Surface: 929 acres Subsurface: 3,248 acres
2 - ROWs restriction	Open	ROWs avoidance on slopes over 25%. Surface: 14,770 acres	ROWs exclusion on slopes over 25%. Surface: 14,770 acres	ROWs avoidance on slopes over 25%. Surface: 14,770 acres
Sensitive Soils				
3 - Oil and Gas stipulation	Open with standard oil and gas stipulations	CSU Surface: 39,230 acres Subsurface: 268,414 acres	NSO Surface: 39,230 acres Subsurface: 268,414 acres	CSU Surface: 39,230 acres Subsurface: 268,414 acres
4 - ROWs restriction	Open	ROWs avoidance Surface: 45,954 acres	ROWs exclusion Surface: 45,954 acres	ROWs avoidance area Surface: 45,954 acres

Table 4-27
Water Resource Management Actions by Alternative

Management Action	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
1 - Oil and Gas stipulation	NSO in floodplains (flooded soils), wetlands, and riparian areas Surface: 13,397 acres Subsurface: 63,426 acres	NSO within 300 feet of floodplains (flooded soils), wetlands, riparian areas and water bodies. Surface: 30,487 acres Subsurface: 146,169 acres		
2 - ROW restrictions	Open	ROWs avoidance Surface: 13,397 acres	ROWs exclusion Surface: 13,397 acres	ROWs avoidance Surface: 13,397 acres

Wildlife and Special Status Species: Under Alternative A, management and treatment of prairie dog colonies would occur on a case-by-case basis. Management activities for wildlife, especially wildlife management decisions that protect soils from surface disturbances, are anticipated to have moderate short- and long-term protective effects on soil resources. In this alternative there are no protection priority areas for sage-grouse which would protect surface acres; however, there is a 1/4

mile oil and gas NSO stipulation around leks. Sensitive raptor species nests have a 1/2 mile oil and gas NSO stipulation. A 1/4 mile NSO oil and gas restriction protects reservoirs with fisheries. See Table 4-28.

Table 4-28
Wildlife Management Actions by Alternative

Management Action	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
1/4 Mile of Reservoirs with Fisheries				
4 - Oil and Gas stipulation	NSO restrictions. Surface: 551 acres Subsurface: 12,548 acres			
5 - ROWs restriction	Open	Avoidance area for all types of ROWs. Surface: 1,018 acres	Exclusion area for all types of ROWs. Surface: 1,018 acres	Avoidance area for all types of ROWs. Surface: 1,018 acres
Bighorn Sheep Habitat				
12 - Oil and Gas stipulation	Open with standard oil and gas stipulations	Lease with NSO restrictions. Surface: 788 acres Subsurface: 58,072 acres		
17 - ROWs Restrictions	Open (all types of ROWs)	ROWs Avoidance(all types of ROWs) Surface: 875 acres	ROWs Exclusion (all types of ROWs) Surface: 875 acres	ROWs Avoidance (all types of ROWs) Surface: 875 acres
Raptors (not defined as SSS)				
10 - Oil and Gas stipulation	Open with standard oil and gas stipulations	NSO 1/4 mile of nest. Surface: 544 acres Subsurface: 3,059 acres	NSO 1/2 mile of nest. Surface: 2,258 acres Subsurface: 13,674 acres	NSO 1/4 mile of nest. Surface: 544 acres Subsurface: 3,059 acres
11 - ROWs restriction	Open (all types of ROWs)	Avoidance within 1/4 mile (all types of ROWs) Surface: 657 acres	Exclusion within 1/4 mile (all types of ROWs) Surface: 657 acres	Renewable energy ROWs. Exclusion 1/4 mile from nests. Surface: 657 acres
				Other ROWs. Avoidance 1/4 mile from nests. Surface: 657 acres
Wintering Areas (Big Game and Greater Sage-Grouse)				
8- Oil and Gas stipulation	TL: 12/1-3/31 Surface: 106,382 acres Subsurface: 411,150 acres			
9 - ROWs restriction on big game wintering areas	Open	ROWs Avoidance Area Surface: 84,674 acres	ROWs Exclusion Area Surface: 84,674 acres	Exclusion Area for Renewable Energy ROWs. Surface: 84,674 acres
				Avoidance Area for other types of ROWs. Surface: 84,674 acres
Sharp-tailed Grouse / Greater Prairie-Chicken				
5 – Oil and Gas stipulation on or near brood rearing/nesting habitat	TL: 3/1-6/15 2 miles leks Surface: 1,316 acres Subsurface: 15,378 acres	TL: 3/1-6/30 2 miles leks Surface: 1,316 acres Subsurface: 15,378 acres	TL: 3/1-6/30 3 miles leks Surface: 2,736 acres Subsurface: 34,605 acres	TL: 3/1-6/30 2 leks Surface: 1,316 acres Subsurface: 15,378 acres
5 - ROWs restriction on or near brood rearing/nesting habitat	Open (all types of ROWS)	ROWs avoidance 2 miles from leks (all types of ROWS) Surface: 1,366 acres	ROW exclusion 3 miles from leks (all types of ROWs) Surface: 2,811 acres	ROW avoidance 2 miles from leks (all types of ROWs) Surface: 1,366 acres
6 - Oil and Gas stipulation on structures that create raptor perches on or near brood	Open with standard oil and gas stipulations	CSU 2 miles from leks Surface: 1,316 acres Subsurface: 15,378 acres		

Table 4-28 Wildlife Management Actions by Alternative				
Management Action	***Alternative A (Current Management)***	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
rearing/nesting habitat				
2 - Oil and Gas stipulation on or near leks	NSO: 1/4 mile from leks Surface: 0 acres Subsurface: 163 acres		NSO: 1/2 mile from leks Surface: 27 acres Subsurface: 805 acres	NSO: 1/4 mile from leks Surface: 0 acres Subsurface: 163 acres
3 - ROWs restriction on or near leks	Open (all types of ROWS)	ROW avoidance within 1/4 miles of leks (all types of ROWS). Surface: 0 acres	Row exclusion within 1/2 mile of leks (all types of ROWS). Surface: 30 acres	ROWs exclusion within 1/4 mile of leks for renewable energy. Surface: 0 acres
				ROW avoidance for other types of ROWs within 1/4 mile of leks. Surface: 0 acres
Raptors deemed Sensitive Status Species (not Bald Eagle or Peregrine Falcon)				
6 - Oil and Gas stipulation	NSO 1/2 mile of nests. Surface: 1,837 acres Subsurface: 10,636 acres	NSO: ¼ mile of nests. Surface: 499 acres Subsurface: 7,510 acres	NSO: ½ mile of nests. Surface: 1,837 acres Subsurface: 10,636 acres	NSO: ¼ mile of nests. Surface: 499 acres Subsurface: 7,510 acres
7 - ROWs restriction	Open (all types of ROWS)	ROW avoidance within 1/4 mile of nests (all types of ROWs). Surface: 554 acres	ROW exclusion within 1/2 mile of nests (all types of ROWs). Surface: 2,160 acres	Renewable Energy ROW exclusion within 1/4 mile of nests. Surface: 554 acres
				ROW avoidance for other types of ROWs within 1/4 mile of nests. Surface: 554 acres
Greater Sage-Grouse				
17, 18, 19 - Oil and Gas stipulation on Greater Sage-Grouse PPAs	No PPAs designated.\ NSO 1/4 mile from leks. Surface: 916 acres Subsurface 1,950 acres TL 3/1-6/31 2 mi. from leks Surface: 27,634 acres Subsurface: 73,828 acres	NSO Surface: 83,744 acres Subsurface: 253,357 acres	Closed Surface: 93,266 acres Subsurface: 289,563 acres	NSO Surface: 83,744 acres Subsurface: 253,357 acres
20 - ROWs restriction on Greater Sage-Grouse PPAs	Open (all types of ROWS)	ROWs avoidance area (all types of ROWs). Surface: 84,384 acres	ROWs exclusion (all types of ROWs). Surface: 96,379 acres	ROWs exclusion for renewable energy. Surface: 84,384 acres
				ROW avoidance for other types of ROWs. Surface: 84,384 acres
9 - Oil and Gas stipulation outside PPAs in GHAs	NSO 1/4 mile from leks. Surface: 81 acres Subsurface: 816 acres TL: 3/1-6/31 2 miles from leks Surface: 5,109 acres Subsurface: 23,584 acres	NSO 1/2 mile from leks. Surface: 509 acres; Subsurface: 2,072 acres	NSO 1 mile from leks Surface: 767 acres Subsurface: 1,846 acres	NSO 1 mile from leks Surface: 2,407 acres Subsurface: 6,243 acres
10 - ROWs restriction outside PPAs in GHAs	Open (all types of ROWs)	ROW avoidance 1/2 mile from leks (all types of ROWs). Surface: 526 acres	ROW exclusion 1 mile from leks (all types of ROWs). Surface: 806 acres	Renewable Energy ROWs exclusion within 1 mile of leks. Surface: 2,617 acres
				ROW avoidance for

Table 4-28
Wildlife Management Actions by Alternative

Management Action	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
				other ROWs within 1 mile of leks. Surface: 2,617 acres
14 - ROWs restriction on brood rearing/nesting habitat outside of PPAs in GHAs	Open (all types of ROWs)	ROWs avoidance 3 mile from leks (all types of ROWs). Surface: 16,835 acres	ROW exclusion 4 mile from leks (all types of ROWs. Surface: 20,362 acres	ROW avoidance 4 mile from leks (all types of ROWs). Surface: 32,125 acres
Oil and Gas stipulation on Greater Sage-Grouse wintering areas	TL: 12/1-3/31 Surface: 50,791 acres Subsurface: 103,553 acres			CSU: Plan required for surface-disturbing and disruptive activities that occur from 12/1-3/31 to minimize impacts to sage grouse. Surface: 50,791 acres Subsurface: 103,553 acres
ROWs restriction on Greater Sage-Grouse wintering areas	Open (all types of ROWs)	ROWs avoidance for all types of ROWs Surface: 31,772 acres	ROWs exclusion for all types of ROWs. Surface 31,772 acres	Exclusion within winter range for Renewable Energy ROWs. Surface: 31,772 acres
				Avoidance within winter range for other types of ROWs. Surface: 31,772 acres

Forest and Woodland Products: Forest and woodland products would be managed to benefit soil resources and offered for sale when they have an economic value. The Probable Sale Quantity of forest and woodland products would be 7,000 tons per year. Short- and long-term adverse impacts to soils resulting from resource use activities are anticipated to be minor.

Lands and Realty: Construction of ROWs would have the greatest impact to soil resources under Alternative A. Although projected surface disturbances from ROW construction are similar to other alternatives (Table 4-29), only the soil-specific, slope-related (over 30 percent) surface use restrictions implemented under the other alternatives would be applied. Under Alternative A, short- and long-term adverse impacts to soils are anticipated to be moderate. In the short term, 136 acres would be impacted, and 79 acres would be impacted in the long term (Tables 4-23 and 4-24).

Management activities for other resources with ROW restrictions protect soils from surface disturbances; having moderate short- and long-term protective effects on soil resources. Within Alternative A, there are current restrictions which exclude ROWs, for a total of 5,522 acres; preventing the degradation of soil resources in this area. See Table 4-29.

Table 4-29
ROW Surface Use Stipulations for the Decision Area by Alternative
(Acres)

	Alternative A (Current Management)†	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Exclusion	5,522	--	199,420	5,836
Avoidance	--	189,153	--	191,704
Open	267,768	84,137	73,870	75,750

Livestock Grazing: Under Alternative A, livestock grazing would be allowed on about 271,000 acres, and the amount of forage available for preference on these lands would be about 73,400 AUMs. AUMs could be adjusted based on monitoring of allotment grazing capacity.

Impacts to soils from livestock grazing would be similar to those addressed in Impacts Common to All Alternatives. Overall livestock grazing would have a net minor beneficial short- and long-term impact to soils through continued implementation of the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management for all alternatives. Assessed upland health sites and riparian areas would be expected to continue making significant progress toward meeting the Standards.

Minerals – Fluid: Approximate acreage that would be closed to fluid mineral leasing and acreage that would be open subject to NSO and CSU across the entire planning area, under the High and Moderate RFD scenarios (USDI, BLM 2009c), are listed in Table 4-30. Soils would be protected on these acres because fluid mineral surface-disturbing activities would be limited or not allowed.

Table 4-30
Cumulative Acres Available or Unavailable for Oil and Gas Leasing[1]

	Alternative A (Current Management)	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
	Surface[2] and Subsurface[3]	Surface[2] and Subsurface[3]	Surface[2] and Subsurface[3]	Surface[2] and Subsurface[3]
Acres Restricting Oil and Gas Leasing, leading to Soil Resources Protection				
Closed	Fort Meade and Fossil Cycad Surface: 6,894 acres Subsurface: 6,894 acres	Fort Meade Surface: 6,574 acres Subsurface: 6,574 acres	Greater Sage-Grouse PPAs, BHAD, Fort Meade, Fossil Cycad, and Bear Butte Surface: 100,160 acres Subsurface: 309,576 acres	Fort Meade, Fossil Cycad, and Bear Butte Surface: 6,894 acres Subsurface: 7,304 acres
No Surface Occupancy (NSO)	Surface: 15,489 acres Subsurface: 87,349 acres	Surface: 105,837 acres Subsurface: 404,306 acres	Surface: 43,897 acres Subsurface: 355,396 acres	Surface: 107,025 acres Subsurface: 406,005 acres
Controlled Surface Use (CSU)	Surface: 2,954 acres Subsurface: 19,613 acres	Surface: 10,561 acres Subsurface: 158,501 acres	Surface: 1,535 acres Subsurface: 1,535 acres	Surface: 10,031 acres Subsurface: 146,574 acres
Cumulative Areas of Oil and Gas Leasing, not contributing to Soil Resources Protection				
Timing Limitations (TL)	Surface: 115,204 acres Subsurface: 450,032 acres	Surface: 61,186 acres Subsurface: 305,570 acres	Surface: 45,836 acres Subsurface: 244,689 acres	Surface: 66,821 acres Subsurface: 340,948 acres
Standard Lease Terms	Surface: 103,033 acres Subsurface: 798,690 acres	Surface: 59,416 acres Subsurface: 487,627 acres	Surface: 52,146 acres Subsurface: 451,382 acres	Surface: 52,803 acres Subsurface: 461,747 acres

[1] Acreages by subcategory were calculated such that each column of subcategories under each alternative adds up to the total available acres for leasing based on the following general concepts where multiple stipulations overlapped: Unavailable land categories override available land categories. Within available lands, NSO stipulations override and are more restrictive than Timing Limitations, Controlled Surface Use, and Standard Lease Terms. Timing Limitation stipulations override and are more restrictive than CSU stipulations and Standard Lease Terms. CSU stipulations override and are more restrictive than Standard Lease Terms.
[2] BLM-administered surface acres with federal oil and gas minerals underneath.
[3] All surface with federal oil and gas minerals underneath

Under Alternative A, approximately 82 acres of soils, out of 274,000 acres on BLM surface, would be disturbed for the short term and 49 acres for the long term (Tables 4-23 and 4-24). Because surface use stipulations are less extensive under Alternative A than under the other alternatives, more sensitive soils would be affected, and total short- and long-term adverse impacts to soils would be greater than under the other alternatives. Under Alternative A, short- and long-term

adverse impacts would be moderate. Impacts would largely consist of a very small amount of increased sedimentation and fugitive dust liberated until long-term and full revegetation is implemented.

Renewable Energy: Construction of renewable energy facilities such as wind turbine foundations or solar arrays would have the greatest impact to soil resources under Alternative A. Surface disturbances from renewable energy development under Alternative A would affect approximately 924 acres (0.4 percent) of BLM-administered surface in the short term and approximately 231 acres (0.1 percent) in the long term (Tables 4-23 and 4-24). There are no soil-specific surface use restrictions for ROWs (Table 4-26). ROWS are excluded in a portion of the Fort Mead ACEC, totaling 5,522 acres (Table 4-31). Under Alternative A, short- and long-term adverse impacts to soils are anticipated to be moderate to minor, chiefly due to the low expressed interest in developing renewable energy resources within the planning area.

Table 4-31
Renewable Energy Surface Use Stipulations for Decision Area
BLM-Administered Surface by Alternative

	Alternative A (Current Management)		***Alternative B***		***Alternative C***		***Alternative D (Preferred Alternative)***	
	Acres	***Planning Area Percentage***	***Acres***	***Planning Area Percentage***	***Acres***	***Planning Area Percentage***	***Acres***	***Planning Area Percentage***
Exclusion	5,521	2%	--	--	199,420 acres	73%	118,904 acres	43.5%
Avoidance	--	--	189,153 acres	69.2%	--	--	78,636 acres	28.8%
Open	267,768	98%	84,137 acres	30.8%	73,870 acres	27%	75,751 acres	27.7%

Special Designations: The restrictions and other actions associated with the Fossil Cycad and Fort Meade ACECs would limit impacts to soils in these areas.

Impacts under Alternative B

Under Alternative B, the steep slopes CSU would be expanded to include all areas with slopes greater than 25 percent, thereby providing a greater level of protection for soil resources than Alternative A. Additional CSU stipulations covering sensitive soils would apply under Alternative B. See Table 4-26.

Water Resources: Under Alternative B, management dictates an NSO stipulation of floodplains, wetlands, and riparian areas. These areas would be avoided for ROWs. Compared to Alternative A, Alternatives B, C, and D protect more areas as they provide an additional 300 foot buffer of NSO restrictions around these features and provide a ROW avoidance for these features. See Table 4-27.

Fire Management and Ecology: Effects on treatment areas to emphasize healthy forest conditions and to restore desired ecological conditions of rangelands would be the same as described in Alternative A. Meeting measurable landscape level objectives for other resources via prescribed burning would provide a greater level of protection for soil resources than under Alternative A. Short-term adverse impacts would be greater than under Alternative A due to an increase in the amount of land treated. However, this would create a greater long-term benefit as the risk of large wildfire is reduced.

Wildlife and Special Status Species: Under Alternative B, treatment of prairie dog colonies would be considered if prairie dogs are causing adverse impacts to soil resources. Reintroduction of prairie dogs to public lands would not be considered. Greater protective effects on soil resources due to wildlife management actions would occur than under Alternative A due to implementation of additional surface use restrictions. A 1/4 mile NSO oil and gas restriction would apply to reservoirs with fisheries. The same region is an avoidance area for ROWs. Bighorn sheep habitat has NSO oil and gas lease stipulations and ROWs are avoided. Raptor nests defined as sensitive status species have an NSO stipulation within 1/4 mile of the nests; and an avoidance of ROWs within 1/4 mile. Raptors not defined as sensitive status species have an NSO stipulation and avoidance of ROWs within 1/4 mile of the nest. Wintering areas for big game and sage-grouse are

an avoidance area for all ROWs. Sharp-tailed grouse and greater prairie-chicken leks have ROWs avoided within two miles of their leks. Leks also have a 1/4 mile NSO stipulation and a two mile CSU stipulation. Greater Sage-Grouse have a variety of NSO stipulations and ROW avoidance areas which are being proposed. These actions are shown in detail, along with other wildlife impact analysis, in Table 4-28.

Forest and Woodland Products: Forest and woodland products would be managed as under Alternative A, with the addition of potential treatment of products with no economic value. Increased treatments (including chemical treatments) could produce higher impacts to soils than under Alternative A. Construction of permanent roads would increase surface runoff velocity and decrease infiltration; erosion of soils would increase, however, utilization of mitigation measures such as BMPs would reduce or eliminate these impacts. Construction of roads would remove land from production through clearing and compaction, although it is anticipated that few roads (less than 10 miles) would be constructed to access forest products. Overall, short- and long-term impacts to soil resources from resource use activities are anticipated to be minor to moderate under this alternative, and greater than under Alternative A.

Lands and Realty: ROW surface use restrictions would be more extensive than under Alternative A. Soil-specific ROW avoidance would be implemented and would decrease adverse impacts to soils by restricting surface disturbances on sensitive soils and steep slopes on 45,954 and 14,770 acres, respectively (Table 4-26). Total surface disturbances would be slightly less than for Alternative A. Under Alternative B, short- and long-term adverse impacts to soils are anticipated to be minor. In the short term, 133 acres would be impacted, and 77 acres would be impacted in the long term (Tables 4-23 and 4-24).

Management activities for other resources with ROW restrictions protect soils from surface disturbances; having moderate short- and long-term protective effects on soil resources. Within Alternative B, proposed restrictions place an avoidance on ROWs for a total of 189,153 acres; limiting and in some cases preventing the degradation of soil resources in this area. See Table 4-29.

Livestock Grazing: Lands available for grazing under Alternative B would increase by 1,000 acres over Alternative A, resulting in 272,000 acres grazed. Similarly, AUMs would increase for lands available for grazing. An additional increase of up to 5 percent AUMs on allotments may be allowed based on monitoring results of implemented Allotment Management Plans (AMPs). Although potential use of land for livestock grazing would increase under this alternative, adverse impacts to soil resources are anticipated to be similar to those under Alternative A because of AMP implementation and achievement of Rangeland Health Standards.

Impacts to soils from livestock grazing would be similar to those addressed in Impacts Common to All Alternatives. Overall, livestock grazing would have a net minor beneficial short- and long-term impact to soils through continued implementation of the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management for all alternatives. Assessed upland health sites and riparian areas would be expected to continue making significant progress toward meeting the Standards.

Minerals – Fluid: CSU stipulations would apply to sensitive soil areas (those with low restoration potential and/or low fugitive dust resistance). See Table 4-26.

Table 4-30 lists the acreage that would be restricted due to closed, NSO and CSU stipulations for Alternative B. Fewer wells and associated infrastructure would be constructed than under Alternative A. Fewer short-term (65 acres) and long-term (39 acres) surface disturbances, out of 274,000 acres on BLM surface, are anticipated to occur than under Alternative A (Tables 4-23 and 4-24). Additionally, more CSU stipulations would apply to fluid mineral leases resulting in greater protection to soil resources and fewer impacts than under Alternative A. Impacts would largely consist of a very small amount of increased sedimentation and fugitive dust liberated until long-term and full revegetation is implemented.

Recreation: Development of hiking trails in the vicinity of Deadwood would increase the potential for adverse impacts to soil resources. Compaction and clearing of trails would remove this land from production. An estimated 15 miles of 6 foot wide clearing would total approximately 10 acres. If hiking trails were developed the compacted area would be approximately 2 acres. Establishment of additional trails would create minor to moderate adverse, long-term impacts to soil resources at greater levels than under other alternatives.

Renewable Energy: Fewer acres of short- and long-term disturbance would occur than under Alternative A. Surface disturbances from renewable energy development under Alternative B would affect approximately 768 acres (0.2 percent) of BLM-administered surface in the short term and approximately 192 acres (less than 0.1 percent) in the long term (Tables 4-23 and 4-24). As shown in Table 4-26, sensitive soils and soils on steep slopes would be avoided. Short- and long-term impacts to soil resources resulting from renewable energy development would be minor and of lesser magnitude than under Alternative A.

Travel Management: Under Alternative B, positive impacts to soil resources would be higher than under Alternative A, due to potential road closures.

Special Designations: The restrictions and other actions associated with the Fossil Cycad and Fort Meade ACECs would limit impacts to soils in these areas. Oil and Gas NSO lease stipulations would be applied to the Fossil Cycad ACEC under Alternative B, but the ACEC would not be closed to leasing. Because no surface or subsurface occupancy would be allowed, and extraction of minerals from Fossil Cycad subsurface would occur only through horizontal flow, no adverse impacts to soils would occur.

Impacts under Alternative C

Under Alternative C, the steep slope and sensitive soil CSU stipulations would be modified to NSO. ROWs would also become exclusion areas, instead of avoidance areas. Please see Table 4-26. The additional soil resource-specific NSO lease stipulations would provide higher levels of protection for soil resources than under Alternatives A, B and C except for very steep slopes (slopes over 50 percent) which would be provided additional NSO protection in Alternative D.

Cultural Resources: Under Alternative C, 410 acres of subsurface minerals near Bear Butte would be retained by the BLM or recommended for withdrawal from mineral entry. This withdrawal would provide a greater level of protection from disturbance that may otherwise result from mineral extraction activities than under Alternatives A and B.

Vegetation: Under Alternative C, non-native introduced seed species would only be used when native seed species are unavailable or as a nurse crop to re-establish native vegetation on a disturbed site. This would provide a slightly lower level of protection of soil resources than under Alternatives B and D.

Water Resources: Under Alternative C, management dictates an NSO stipulation of floodplains, wetlands, and riparian areas. There is an exclusion of all ROWs within these areas. Compared to Alternative A, Alternatives B, C, and D protect more areas as they provide an additional 300 foot buffer of these NSO restrictions around these features and require these features to be ROW exclusion areas. See Table 4-27.

Fire Management and Ecology: Effects on treatment areas to emphasize healthy forest conditions and to restore desired ecological conditions of rangelands would be the same as described in Alternative A. Excluding Greater Sage-Grouse PPAs from fire treatments is anticipated to reduce short-term adverse and long-term protection for soil resources within the planning area, when compared to Alternative B.

Wildlife and Special Status Species: Under Alternative C, treatment of prairie dog colonies would be considered only for public health and safety. Reintroduction of prairie dogs to historic colonies or large unfragmented blocks of public land would also be considered. Overall, when compared to the other alternatives, Alternative C would have the most protective effects on soil resources due to wildlife management actions (surface use restrictions). A 1/4 mile NSO oil and gas restriction would apply to reservoirs with fisheries. The same region is an exclusion area for ROWs. Bighorn sheep habitat has NSO oil and gas lease stipulations and ROWs are avoided. Raptor nests defined as sensitive status species have an NSO stipulation and an exclusion of ROWs within 1/2 mile. Raptors not defined as special status species have an NSO stipulation of 1/2 mile; and avoidance of ROWs within 1/4 mile of nests. Wintering areas for big game and sage-grouse are an exclusion area for all ROWs. Sharp-tailed grouse and greater prairie-chicken leks have ROWs excluded within three miles of their leks. Leks also have a 1/2 mile NSO stipulation and a two mile CSU stipulation. Sage-grouse have a variety of closed and NSO stipulations and ROW exclusion areas which are being proposed. Please see these actions in detail, along with other wildlife impact analysis in Table 4-28.

Forest and Woodland Products: Forest and woodland product treatments would favor natural treatment processes to work toward desired conditions. Off-site removal of economically valuable forest products would be allowed where no permanent roads would be required. The Probable Sale Quantity for all forest and woodland products would be 6,000 tons per year. Forest and woodland product resource use would create the least detrimental impacts to soil resources under Alternative C.

Lands and Realty: Alternative C would provide the highest level of ROW surface use restrictions when compared to the other alternatives. Soil-specific ROW exclusion areas, as shown in Table 4-26, would apply to sensitive soils and slopes over 25 percent, providing a higher level of protection to soil resources. Under Alternative C, surface disturbance acreage and short- and long-term adverse impacts to soils are anticipated to be minor and less than under the other alternatives. In the short term, 88 acres would be impacted, and 51 acres would be impacted in the long term (Tables 4-23 and 4-24).

Management activities for other resources with ROW restrictions protect soils from surface disturbances; having moderate short- and long-term protective effects on soil resources. Within Alternative C, restrictions are proposed which exclude ROWs, for a total of 199,420 acres; preventing the degradation of soil resources in this area. See Table 4-29.

Livestock Grazing: Lands available for livestock grazing and available AUMs would be the same as described in Alternative A, except no increases in AUMs would be allowed. Impacts to soils from livestock grazing would be similar to those addressed in impacts common to all resources. Overall, livestock grazing would have a net minor beneficial short- and long-term impact to soils through continued implementation of the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management for all alternatives. Assessed upland health sites and riparian areas would be expected to continue making significant progress toward meeting the Standards.

Minerals – Fluid: NSO stipulations would apply to sensitive soil areas (those with low restoration potential and/or low fugitive dust resistance). See Table 4-26.

Table 4-30 lists the approximate acreage that would be closed to fluid mineral leasing, which would be significantly more due to ACEC and Black Hills Army Depot closures, and acres that would be open subject to NSO and CSU for Alternative C. More NSO and CSU stipulations would also apply to fluid-mineral leases and would provide greater protection to soil resources than under Alternatives A and B. Fewer wells and infrastructure would likely be constructed than under Alternatives A and B. Total short-term (37 acres) and long-term (22 acres) surface disturbances, out of 274,000 acres on BLM surface, are anticipated to be much less than under Alternative B. Impacts would largely consist of a very small amount of increased sedimentation and fugitive dust liberated until long-term and full revegetation is implemented.

Recreation: Impacts to soil resources from recreational uses in the planning area would be the same as described for Alternative A.

Renewable Energy: Surface disturbances from renewable energy development under Alternative C would affect approximately 588 acres (0.1 percent) of BLM-administered surface in the short term and approximately 78 acres (less than 0.1 percent) in the long term (Tables 4-23 and 4-24). Under Alternative C, NSO lease stipulations would apply to sensitive soils and soils of over 25 percent, providing the greatest level of protection when compared to the other alternatives (Table 4-26). Renewable energy development would be excluded from more surface use acreage than under the other alternatives, 199,420 acres (Table 4-31). Short- and long-term impacts to soil resources resulting from renewable energy development would be minor and of slightly lesser magnitude than under the other alternatives.

Travel Management: Travel management activities would create the greatest positive impacts to soil resources under this alternative by prohibiting most cross-county travel and minimizing the construction of new roads, rerouting of existing roads, and potentially closing roads.

Special Designations: Compared to Alternative B and D, a sage-grouse PPA ACEC designation in Alternative C would not provide increased levels of soil protection as adequate protective measures are set forth under PPAs management actions under Alternatives B and D. Under Alternatives B and D these measures would be implemented regardless of an ACEC designation for Greater Sage-Grouse PPAs.

Designation of a sage-grouse ACEC would stimulate public interest about this area. Calling attention to a sage-grouse PPA through an ACEC designation may result in a slight increase in visitor use from people driving out to watch the strutting

activity of sage-grouse during March and April when soils and drainage crossing on unimproved two-track roads are saturated and sensitive to damage. The impacts to soil and water resources from additional visitor use would be slight and limited to small areas.

Impacts under Alternative D (Preferred Alternative)

Under Alternative D, the sensitive soil CSU stipulation would be the same as under Alternative B. For slopes 25-50 percent, the CSU stipulation would be the same as Alternative B. The ROW restrictions as described in Alternative B would also apply to Alternative D (refer to Table 4-26). The CSU and avoidance restrictions on soils would provide less protection than Alternative C which provides NSO and exclusion restrictions. The exception is that Alternative D would provide an additional measure of protection through an NSO stipulation on very steep slopes (over 50 percent). The other alternatives do not provide specific protective measures on very steep slopes.

Cultural Resources: Retention of acreage or recommendation for acreage withdrawal from mineral entry and protection from surface-disturbing activities would be the same as under Alternative C and greater than under Alternatives A and B.

Water Resources: Under Alternative D, management dictates an NSO stipulation of floodplains, wetlands, and riparian areas. There is an avoidance of these areas for ROWs. Compared to Alternative A, Alternatives B, C, and D protect more areas as they provide an additional 300 foot buffer of these restrictions around these features and require these features to be ROW avoidance areas. See Table 4-27.

Fire Management and Ecology: Effects on treatment areas to emphasize healthy forest conditions and to restore desired ecological conditions of rangelands would be the same as described in Alternative B.

Wildlife and Special Status Species: Under Alternative D, the types of beneficial and adverse impacts to soil resources would be the same as under the other alternatives. Management of existing prairie dog colonies would be the same as under Alternative B. Prairie dogs could be considered for reintroduction under the same circumstances as under Alternative C. Wildlife management actions under Alternative D would create greater protective effects on soil resources than under Alternatives A and B, but less than under Alternative C. A 1/4 mile NSO oil and gas restriction for reservoirs with fisheries would be applied. The same region is an avoidance area for ROWs. Bighorn sheep habitat has NSO oil and gas lease stipulations and ROWs are avoided. Raptor nests defined as sensitive status species have an NSO stipulation within 1/4 mile of the nests. Within this area renewable energy ROWs are excluded, while other types of ROWs are avoided. Raptors not defined as special status species have an NSO stipulation and an exclusion of renewable energy ROWs with an avoidance of other types of ROWs within 1/4 mile of nests. Wintering areas for big game and sage-grouse are an exclusion area for renewable energy ROWs and an avoidance area for all other types of ROWs. Sharp-tailed grouse and greater prairie-chicken leks have a 1/2 mile renewable energy ROW exclusion, with a two mile avoidance area for other types of ROWs. Leks also have a half-mile NSO stipulation and a two mile CSU stipulation. Sage-grouse have a variety of NSO stipulations, exclusion areas for renewable energy ROWs, and avoidance areas for other types of ROWs which are being proposed. Please see these actions in detail, along with other wildlife impact analysis in Table 4-28.

Forest and Woodland Products: Management of forest and woodlands product usage would be the same as under Alternative B, except at the Fort Meade ACEC, where road realignment (may be considered a new permanent road) would be allowed to protect other resources. A new alignment to reduce soil erosion may result in an improvement or "net gain" to the soil resource once revegetation occurs. Overall adverse impacts to soil resources would likely be greater due to allowed road building, than under Alternatives A and C, and the same as Alternative B.

Lands and Realty: ROW surface use restrictions are the same as Alternative B, with avoidance areas on sensitive soils and slopes over 25 percent. Total surface disturbance acreages are anticipated to be the same as under Alternative B. Under Alternative D, short- and long-term adverse impacts to soils are anticipated to be minor. Impact magnitudes due to lands and realty resource uses are anticipated to be lower than Alternative A, higher than under Alternative C, and very similar to Alternative B. In the short term, 133 acres would be impacted, and 77 acres would be impacted in the long term (Tables 4-23 and 4-24).

Management activities for other resources with ROW restrictions protect soils from surface disturbances; having moderate short- and long-term protective effects on soil resources. Within Alternative D, proposed restrictions place exclusion

restrictions covering 118,904 acres for renewable energy ROWs and 5,836 acres for other types of ROWs. A total of 78,636 and 191,704 acres would be avoided on renewable energy ROWs and other types of ROWs, respectively. These restrictions would limit and in some cases prevent the degradation of soil resources in these areas. See Table 4-29.

Livestock Grazing: Impacts to soils from livestock grazing would be similar to those addressed in Impacts Common to All Alternatives. Overall, livestock grazing would have a net minor beneficial short- and long-term impact to soils through continued implementation of the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management for all alternatives. Assessed upland health sites and riparian areas would be expected to continue making significant progress toward meeting the Standards.

Minerals – Fluid: CSU stipulations would apply to sensitive soil areas (those with low restoration potential and/or low fugitive dust resistance). See Table 4-26.

Table 4-30 lists the approximate acreage that would be closed to fluid mineral leasing and acreage that would be open subject to NSO and CSU in the planning area for Alternative D. A similar number of wells and infrastructure would likely be constructed as under Alternative B. Total surface disturbances are anticipated to be the same or similar as under Alternative B. The same number of acres would be closed to fluid mineral development as under Alternative A. Impacts would largely consist of a very small amount of increased sedimentation and fugitive dust liberated until long-term and full revegetation is implemented.

NSO lease stipulations for oil and gas activities would be the same as under Alternative B. Management of soil resources through CSU implementation (as opposed to NSO implementation under Alternative C) would potentially create higher levels of moderate short-term impacts to soil resources and similar long-term impacts when compared to Alternative C.

Recreation: Soil resource impacts due to recreational uses in the planning area would be the same as described under Alternative B.

Renewable Energy: Surface disturbances from renewable energy development under Alternative D would affect approximately 520 acres (0.2 percent) of BLM-administered surface in the short term and approximately 130 acres (less than 0.1 percent) in the long term (Tables 4-23 and 4-24). Sensitive soils and soils on slopes of over 25 percent would be protected due to implementation of CSU and NSO restrictions (Table 4-26). Less total acreage would be excluded from renewable energy development than under Alternative C; significantly fewer acres have avoidance restrictions when compared to Alternative B (Table 4-31). Short- and long-term impacts to soil resources resulting from renewable energy development would be minor and of lesser magnitude than under Alternatives A and B, but greater than under Alternative C.

Travel Management: Positive impacts to soil resources would be more than those described under Alternative A, but less than those described under Alternative C, and potentially less than under Alternative B, depending on public support for keeping roads open.

Special Designations: The restrictions and other actions associated with the Fossil Cycad and Fort Meade ACECs would limit impacts to soils in these areas.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present actions that have affected and would continue to affect soil resources include mineral exploration and development; livestock grazing; recreation; vehicle travel; and wildfire and prescribed fire. In general, these actions have cumulative impacts on soil resources by causing surface disturbance contributing to soil compaction, erosion, and subsequent sedimentation.

It is anticipated that over 90 percent of rangelands would continue to meet Standards for Rangeland Health. Over the life of the plan the BLM expects 1,400 acres of upland to improve through the implementation of Standards. This would increase

ground cover and reduce erosion. It could also increase site productivity as organic matter and nutrients build up. It is a small number of acres, but indicates an overall improvement in soil health.

The areas considered in the analysis in this section are the nine counties with substantial amounts of BLM surface and mineral estate (Harding, Butte, Lawrence, Pennington, Custer, Fall River, Meade, Perkins, and Stanley counties). Wheat, flax, hay, and sunflowers are the major crops produced on private land in this area. Of the 12.7 million acres in these counties about 50 percent of the area is rangeland.

Compared to other areas, the Northern Great Plains is experiencing a high conversion rate of grasslands to croplands (USDA, Economic Research Service, 2007). Between 1997 and 2007, USDA estimated that 1.1 percent of rangeland was lost due to cropland conversion in a 77 county study area that was completed for portions of North and South Dakota and western Nebraska (USDA Economic Research Service, 2011). Major factors that influenced this trend include changes in market incentive loans, changes in farm programs such as CRP, and changes in crop disaster insurance. Other major factors include market factors, interest rates, production costs, and increased yield as a result of improved technology.

Based on information in the 2011 USDA report and a review of Natural Agriculture Statistics data, Resources Inventory on planted acres, BLM estimates that a maximum of 66,000 acres of rangeland on privately owned surface are likely to be converted to cropland in the nine counties listed above over the next ten years. If trends continue in this manner, a maximum of 132,000 acres of rangeland may be converted to cropland over the next 20 years. The majority of this conversion would result in surface disturbance, although certain farm practices such as no-till farming and other conservation practices would reduce the degree of disturbance. The acres provided are the maximum number of acres that are expected to be converted from grassland to cropland; actual acres may be lower in certain counties such as western Butte County where soils have lower potential for farming. In addition, areas with marginal soils that receive less than 16 inches of annual precipitation may receive lower levels of conversion of rangeland to croplands. In the nine-county area, the BLM estimates that wind energy development would result in up to 3,500 acres of short-term disturbance and 900 acres of long-term disturbance on lands that are not administered by the BLM (other federal lands, private, state, tribal lands etc.). The maximum levels of wind energy development on BLM-administered surface estate are expected to result in 924 acres of short-term disturbance and 231 acres of long-term disturbance.

The BLM estimates that the conversion of all lands in these counties for other uses such as transportation, infrastructure, and building would occur at a much lesser rate than conversion of rangeland to farm land; however, specific figures are not available. On a nationwide basis, USDA has determined that urban land acreage increased at about twice the rate of population growth in the years 1945 to 2007 (USDA 2007). Urban growth in the nine-county analysis area described in this section is expected to be slow as many of the counties are experiencing slow, static or declining population changes. For example, the population of Harding County in northwest SD declined by seven percent and the population of the county seat (Buffalo, SD) declined by 13 percent from 2000 to 2010. The exception to this trend is the northern Black Hills and areas along the nearby Interstate 90 corridor where subdivision, infrastructure development, and population growth is much higher than other portions of the nine-county cumulative analysis area. For more information about the population growth by area, refer to the Population portion of the Social section of Chapter 3.

Oil and gas development could result in a maximum of 2,380 acres of short-term disturbance (449 wells) and 1,437 acres of long-term disturbance on other (non-BLM-administered) lands in the nine-county area.

Oil and gas development on BLM-administered federal minerals (including BLM surface estate) is expected to result in a maximum of 138 to 301 acres of long-term surface disturbance (43-94 wells). Development of other BLM-administered minerals is expected to result in a maximum of 400 acres of short-term disturbance and 100 acres of long-term disturbance in the nine-county area. Bentonite mining would account for most of the acres disturbed.

Table 4-32 was developed using a combination of sources including the USDA reports cited above (USDA 2007, 2011, 2012), conversations with the mining industry (2010-2012), SD DENR (2012), and the SD RMP development scenarios including the Oil and Gas RFD. The acres below represent the maximum number of acres impacted under any alternative.

Table 4-32
Maximum Number of Acres Expected to Receive Long-Term Alteration*

Activity/Use	*Acres of Non-BLM Lands (private, state, tribal, other federal lands altered)*	*Acres of BLM Surface Estate Altered (does not include split estate lands)*	*Acres of BLM Surface and Split Estate Lands Altered*
Conversion of rangeland to cropland	132,000	0	0
Wind energy development	900	231	300
Oil and gas development	1,437	49	301
Development of locatable, salable, other leasable minerals	620	9	100
Other uses (transportation, buildings, vegetation treatments, etc.)	unknown	87	136
Total	134,957	376	837

*Disturbance of soil, major conversion of vegetation to another vegetation type over the long term, or conversion of land use.

The amount of disturbance on BLM-administered surface estate only would range from 325 to 376 acres (0.00003 percent of the nine counties) of short-term disturbance and 1,950 to 2,290 acres (0.0002 percent of the nine counties) of long-term disturbance under the various alternatives (long-term disturbance is the amount of short-term disturbance that is not reclaimed). The expected levels of surface disturbance from all sources on BLM-administered surface estate are shown in Table 4-23 and also described in the development scenarios at the beginning of this chapter. Under any of the management alternatives, the level of adverse cumulative impacts to soil and water would be negligible because 1) disturbance on BLM surface and mineral estate would be very small in relation to the landscape affected; 2) the disturbance would occur in different watersheds over a 20 year period; and 3) 80-85 percent of the disturbance would be reclaimed.

Actions that result in short-term surface disturbance on both BLM surface and mineral estate (split estate) would range from 4,637 to 5,067 acres of short-term disturbance and 811 to 887 acres of long-term disturbance under the various alternatives. In terms of short-term disturbance, this amounts to a 0.0004 percent of the 12.7 million acres in the nine-county analysis area. In terms of long-term disturbance, this amounts to 0.00007 percent of the 12.7 million acres in the nine-county analysis area.

An RFD action that would affect soil resources under all alternatives would be the proposed Dewey Conveyor ROW. Construction of the proposed conveyor and access road would permanently disturb approximately 16 acres of soils (2.7 acres of BLM surface of the 274,000 BLM surface acres) in the planning area (USDI, BLM 2009c). The access road would be constructed in compliance with BLM standards, but would still be expected to have minor, adverse effects on infiltration rates and soil erosion.

Additional RFD impacts to soils would occur from development of the proposed Dewey-Burdock in-situ uranium mining project. Soils would be disturbed during well field, access road, and processing facility construction. No surface mineral extraction would occur. Because BLM-administered surface lands (240 acres) make up a small portion of the proposed project area (10,580 acres), only minor, short- and long-term adverse impacts would occur to BLM surface. In fact, short-term disturbance at any one time on the project would be 108 to 463 acres, while the total BLM surface expected to be disturbed would be 14.2 acres. Complete well field and access road reclamation would occur after mining operations have ceased. Total dissolved solid and electrical conductivity values in water applied to soils during land application disposal of waste fluids would create minor to moderate adverse, short- and long-term impacts to soil productivity. Soils would also be monitored for changes in radiological character.

Future bentonite development within the planning area is also anticipated. Prior to approval of the Shear-Clarkson mine, 7,447 acres of bentonite deposits were under permit in the planning area. Of this total, the BLM manages 1,101 acres, and 6,346 acres are privately owned. About 63 acres of BLM land have been disturbed by mining and have not yet been reclaimed. Table 4-33 summarizes the past, present, and reasonably foreseeable bentonite mining permit acreages in the planning area. Mining claims are a maximum of 20 acres in size, and some portions of claims may not contain valuable bentonite deposits. Under normal circumstances, 30 percent of permitted lands would actually be mined. Lands outside

mined areas may receive some disturbance from establishment or use of haul roads, equipment movement, and other activities.

Table 4-33
Past, Present, and Reasonably Foreseeable Bentonite Mining Permit Acreages in the Planning Area

Land Type	*Private Land (Federal or Private Minerals)*	*BLM Lands (Surface)*	*Total*
Mining Prior to 2008	6,346 acres	1,101 acres (0.4%)	7,447 acres
Shear-Clarkson Mine	726 acres	118 acres (0.04%)	844 acres
RFD Acres	1,411 acres	289 acres (0.1%)	1,700 acres
Total	8,483 acres	1,508 acres (0.6%)	9,991 acres

Initiating reclamation (recontouring, topsoil replacement, reseeding) immediately following completion of bentonite mining operations would mitigate cumulative impacts. It is anticipated that no more than 100 acres of mined areas would be disturbed at any one time. Cumulative impacts of bentonite mining to soil resources are anticipated to be the same under all alternatives.

Cumulative Impacts under Alternative A (Current Management)

Approximately 1,966 acres of short-term and 376 acres of long-term surface disturbance are anticipated to occur from resource management actions and resource uses under Alternative A (Tables 4-23 and 4-24). Although the fewest total short-term direct impacts to soils would occur under this alternative, this is largely due to the lack of wildland fire management activities that are proposed for the other alternatives. Because wildland fire management activities provide beneficial long-term improvements to soil health, beneficial impacts are anticipated to be less than under other alternatives. The lack of extensive fire management, coupled with the smallest acreage protected by leasing closures and surface use stipulations and the greatest anticipated level of long-term surface disturbance would result in the greatest cumulative impacts to soil resources when compared to the other alternatives. Cumulative adverse impacts to soils are anticipated to be moderate at local scales and minor across the planning area as a whole.

Cumulative Impacts under Alternative B

Approximately 2,174 acres of short-term and 325 acres of long-term surface disturbance are anticipated to occur from resource management actions and resource uses under Alternative B (Tables 4-23 and 4-24). Short-term impacts to soils are anticipated to be greater than under Alternative A due to an increase in wildland fire management activities. These activities are anticipated to provide a greater level of long-term beneficial effects to soils than under Alternative A. Overall, Alternative B would provide an intermediate level of protection for soil resources and mitigation of cumulative impacts when compared to the other alternatives. Cumulative impacts on BLM surface are anticipated to be less than under Alternative A. Cumulative adverse impacts to soils are anticipated to be moderate at local scales and minor across the planning area as a whole.

Cumulative Impacts under Alternative C

Approximately 1,651 acres of short-term and 237 acres of long-term surface disturbance is anticipated to occur from resource management actions and resource uses under Alternative C (Tables 4-23 and 4-24). Short-term impacts to soils are anticipated to be less than under Alternative B due to restrictions on wildland fire management activities in certain areas such as Greater Sage-Grouse PPAs. Although fewer short-term surface disturbances would occur, a lower level of long-term beneficial effects on soils is anticipated to occur than under Alternative B. Fire management activities are anticipated to provide a greater level of long-term beneficial effects to soils than under Alternative A.

While BLM-administered lands would be protected the most under Alternative C, some trade-offs from the high degree of restriction provided may occur. In some cases, an ACEC designation of Greater Sage-Grouse PPAs combined with the closure or withdrawal of all minerals and ROW exclusion in PPAs in Alternative C may shift and concentrate future activities or infrastructure development onto private or non-federal lands adjacent to the PPA ACEC or to private or non-federal lands within the ACEC. Compared to Alternatives A, B and D, Alternative C would create a greater tendency for

proponents of various types of projects to move the location of proposed infrastructure or use to private or non-federal lands within the sage-grouse ACEC. When this occurs, the BLM would lose control over project design features, hazardous materials management, and mitigation of site-specific impacts, and would not be able to require disturbed areas to be reclaimed.

While the NSO stipulation provided in Alternatives B and D would also tend to shift some future oil and gas activities and infrastructure onto private or non-federal lands adjacent to the PPAs or to private or non-federal lands within the PPAs, the impact would be less than Alternative C as an ACEC designation and a non-renewable energy ROW exclusion would not be proposed in combination with an NSO stipulation under Alternatives B and D.

Alternative C would provide the most extensive protections for soil resources on BLM-administered surface when compared to the other alternatives but may cause additional use and activity on private or nonfederal lands adjacent to closed or restricted areas. Cumulative short- and long-term adverse impacts on BLM surface are anticipated to be less than under the other alternatives. Cumulative adverse impacts to soils are anticipated to be moderate at local scales and minor across the planning area as a whole.

Cumulative Impacts under Alternative D (Preferred Alternative)

Approximately 2,290 acres of short-term and 354 acres of long-term surface disturbance is anticipated to occur from resource management actions and resource uses under Alternative D (Tables 4-23 and 4-24). The preferred alternative would provide an intermediate level of protection for soil resources on BLM-administered surface when compared to the other proposed alternatives. Cumulative impacts on BLM surface are anticipated to be less than under Alternatives A and B, but greater than under Alternative C. Cumulative adverse impacts to soils are anticipated to be moderate at local scales and minor across the planning area as a whole.

Water Resources

This section describes the impacts to water resources that may result from the implementation of the actions associated with each of the RMP alternatives. Activities that disturb the soils, alter vegetative cover, disrupt natural drainage patterns, irrigation, and mineral extraction activities result in direct, indirect and cumulative impacts to water resources.

The following discussion addresses key concepts that are fundamental to understanding the effects to water resources.

The BLM manages water for resource values (e.g., watershed health, wildlife, riparian) and resource uses (e.g., recreation and water supply). A combination of BLM management and resource conditions (including upland vegetation, soils, and riparian vegetation) in decision area watersheds affect the quality and quantity of water resources that traverse BLM lands. Protecting water quality and quantity requires BLM to adhere to federal Clean Water Act objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.

Water quantity management is primarily influenced by watershed functions that include capture, storage, and beneficial release of precipitation and runoff. Best management practices (BMPs) include reservoir, pit, pond, spring, and water pipeline developments that function for multiple beneficial uses and provide additional and alternative water sources for wildlife, livestock, recreation, or riparian and wetland vegetation. Reservoirs function to retain water, detain runoff, increase infiltration, and trap potential sediment associated with overland flow. The BLM's operational plan for reservoirs and the effectiveness of BMPs relies on accurate measurements, timely implementation, and monitoring of both implementation and effectiveness.

According to the 2010 South Dakota Integrated Report for Surface Water Quality Assessment, which includes 303(d)/305(b) stream segments, 25.9 miles of impaired streams are on BLM-administered lands. The 25.9 miles represent roughly three percent of the almost 800 miles of 303(d) listed stream reaches that BLM-administered lands come into contact with. Table 3-8 identifies which impaired stream segments occur on BLM lands, along with the probable impairment causes and sources. Probable causes of impairment on BLM lands are salinity, total suspended solids (TSS), fecal coliform, specific conductance, temperature, high pH, and alkalinity. The probable sources listed are crop production, riparian grazing, wildlife, and natural sources.

The BLM manages federal lands with land, soil, and water conservation practices to protect water bodies that currently meet State Water Quality Standards and to improve water quality where beneficial uses are not fully supported. The BLM manages nonpoint source pollution by controlling the cause and source of pollutants through the use of pollution control measures such as BMPs and soil and water conservation practices. These measures are discussed in detail in the South Dakota Nonpoint Source Program Management Plan (SD DENR 2010a). The BLM is responsible for monitoring progress and success once pollution control measures are implemented on BLM-administered lands.

Although the BLM does not manage land directly along the Belle Fourche River, the following summary of the Belle Fourche TMDL Review (SD DENR 2005) provides a snapshot of riparian conditions on rangelands in western South Dakota.

A tributary of the Missouri River, the Belle Fourche River is currently listed as impaired due to a high amount of TSS. The TMDL Review attributed approximately 75 percent of the suspended solids to stream entrenchment (down-cutting) and bank failure, with another 20 percent resulting from irrigation and on-farm waste. Of the amount attributed to stream entrenchment and bank failure, 50 percent was thought to be coming from either natural sources or resulting from altered stream energy (including irrigation discharges); this situation is particularly the case in the eastern portion of the Belle Fourche watershed, which is dominated by reaches with high clay banks.

The other 50 percent of the suspended solids is attributed to riparian degradation, which primarily occurs where cattle have unrestricted access to the streams during the summer. According to the TMDL conceptual sediment budget, approximately 15 to 35 percent of the TSS load in the Belle Fourche River results from riparian degradation; another three to five percent results from rangeland erosion. The TMDL Review then notes that properly functioning riparian areas can significantly reduce non-point source pollution by intercepting surface runoff through settling, filtering, and storing sediment and associated pollutants and by stabilizing banks.

Riparian and wetland areas are the vegetated zones bordering lakes, rivers, reservoirs, estuaries, potholes, springs, seeps, and perennial, intermittent or ephemeral streams, where the water table is usually at or near the surface. The interface between the terrestrial zone and the aquatic zone is the riparian area. Riparian zones are one of the most important defenses against pollutants for a water body. The vegetated area acts as a buffer to reduce the amount of pollutants that reach the water. Ground cover in riparian zones reduces the velocity of runoff and enables water to percolate into the soil. The roots of vegetation filter out certain pollutants that are beneficial (e.g., fertilizers, pesticides, and nutrients) or harmful (e.g., herbicides) to plant growth, and runoff that reaches the receiving water is relatively cleaner than upgradient.

Riparian vegetation, riparian health, and upland health are also used as primary indicators of water quality because these variables directly measure the “cause or source” of the problem (Table 3-8) and not just the end result. This allows for early warning of potential problems and provides an early indication that improvements are occurring. It also enables quick implementation of additional pollution control measures (as needed) that directly address the cause of the problem. Using in-stream indicators would not provide this rapid feedback and may result in unacceptable impacts.

Riparian vegetation is a valuable indicator of potential livestock effects because these plant associations respond readily to changes in management and can be modified to produce conditions more favorable to stream stability and water quality. While instant recovery would be unrealistic, vegetative improvements generally occur faster than other stream components, such as bank morphology. This is important since it enables the BLM to track the most sensitive variable (first to change) while describing the potential effects to stream channels and some water quality parameters. In addition, since the condition of riparian vegetation can also be used to indicate how much time livestock spend adjacent to or in water bodies, it can also be used to evaluate potential sediment, thermal, nutrient and bacterial inputs.

As with riparian vegetation, riparian function can be used as an indicator. Properly functioning riparian areas generally have stable stream banks (low sediment inputs) and are well vegetated (low thermal loading). This condition also suggests that livestock are not spending excessive time in, or immediately adjacent to, the waterway (low bacteria and nutrients). Riparian trends also provide valuable information. Improving trends would indicate that banks are becoming more stable (less sediment), shading is improving (less thermal loading), and livestock are spending less time in, or immediately adjacent to, the waterway (less bacteria or nutrients). Declining trends would likely indicate the opposite. Thus, riparian function can be used as an effective indicator of some aspects of water quality and can actually provide an earlier indication of water quality problems than the water column itself.

The "riparian indicator approach" is consistent with the Environmental Protection Agency (EPA) who reported that the proximity of fecal contamination to a water body is the key element in determining potential effects (USEPA 1993). They also reported that the primary mechanisms for bacterial contamination are the direct deposition of fecal material into the stream or its delivery through overland flow. In semi-arid rangelands where overland flow is the primary delivery mechanism, the potential travel distance is fairly short. This means that most water quality impacts would result from deposition originating inside the riparian area. In fact, the University of Idaho Forest, Wildlife and Range Policy Analysis Group found that water quality impacts from livestock urine and feces generally are not a problem unless cattle congregate near surface water to the point that protective ground cover is less than 50 percent or large amounts of feces and urine are being deposited in or immediately adjacent to surface waters. They also reported that 20 feet was adequate to filter nutrients and bacteria resulting from manure (Mosley, et al. 1997). This means that ensuring healthy and properly functioning riparian areas could improve water quality by reducing the amount of time livestock spend in or adjacent to water bodies.

Upland health can be used as an indicator as it evaluates changes in infiltration, flow patterns, and erosion. Managing for near natural upland runoff and erosion will minimize the risk of excess sediment delivery to project area streams.

Surface-disturbing activities (excavations, grading) affect water resources to varying degrees depending on the type, amount, and location of disturbance; time of year; precipitation; and condition and types of present and surrounding soil and vegetation. Surface-disturbing activities lead to alterations in the chemical, physical, and biological integrity of water when vegetation and protective crusts are removed or manipulated and natural soil architecture and functionality is disrupted. Machinery and vehicles used in surface-disturbing activities could leak or create fluid spills, including engine oil, hydraulic oil, and fuel (gasoline or diesel). Spills could then impact water quality in watersheds following spring runoff or precipitation events. Changes in natural cover or topography can cause or contribute to an increase in sediment delivery to streams. As discussed in the Soil Resources assumptions, surface disturbance to vegetation and soils increases soil erosion by exposing it and making it susceptible to wind and water erosion. In most cases, disturbed areas would be reclaimed if disturbance occurs to a point that vegetation is destroyed and it is not expected to naturally re-establish to pre-disturbance levels. The type of vegetation and amount of vegetative cover desired are primary concerns when considerations about reclamation methods are evaluated. In some cases such as a road ROW, the disturbed area would not be reclaimed or only part of the disturbed area would be reclaimed. In other cases such as fuel and forestry treatments, nearly all disturbed areas would be reclaimed through natural processes or reclamation.

Poorly controlled erosion and sediment transport from surface-disturbing activities on steep slopes adversely impact water quality and hydrology. Surface-disturbing activities can induce rilling and gullying. Rills and gullies are often discontinuous in natural undisturbed areas and disable water flow velocities and energies from reaching the magnitudes attained by continuous flows. Disturbances that lead to erosion of sensitive soil surfaces can form continuous rills and channels which can grow into continuous gullies. Steep slope disturbance usually involves some form of grading. Graded areas that are not yet successfully reclaimed may exhibit poor drainage and increased runoff velocities.

Surface-disturbing activities in and around riparian and wetland areas heighten vulnerability to erosion. Removal of vegetation or degradation of these areas also increases the probability that pollution and sediment would reach water bodies. This probability decreases when a functional riparian zone that is capable of capturing and biologically degrading process pollutants (known as biofiltration) becomes established. Surface-disturbing activities that disturb stream channels and increase stream bank erosion may contribute to the loss of vegetation in riparian areas. This could result in elevated water temperatures and increased turbidity. Elevated water temperatures reduce the solubility of dissolved oxygen and decrease the oxygen carrying capacity of water, which is critical to supporting aquatic life. Riparian areas act as pollution biofilters of pollution and accumulate probable water contaminants. Disrupting and loosening contaminant accumulations by removing or disturbing riparian soils and vegetation may expose surface and subsurface nutrients, fertilizers, and contaminants and allow their introduction into water bodies, thus impairing water quality.

In oil and gas drilling and development, there are many serious and complicated downhole problems (BLM 1992) which must be solved (at least by current technology) by the use of more toxic or uncertain category chemicals (Table 3-7). One solution to decrease the risk of groundwater pollution would be to prevent any long-term storage or any release of chemicals from a drilling system on the well site. This can be done with closed mud systems (using tanks rather than any excavated pits) with removal of mud fluids and fluid-soaked cuttings from the well site, along with state regulation of the disposal of the materials. If a drying system can be devised with the closed mud system, dried cuttings and possibly even mud constituents could potentially be left on location in a closed and capped storage pit.

Another method of decreasing risk of contaminants is to place an impervious engineered cap over a conventional reserve pit. A slightly domed impermeable cap of the reserve pit, engineered to permit little or no rainwater percolating through the cover and into the pit, and engineered to last a very long time, should greatly decrease or even eliminate infiltration, and thus the entrainment and the risk of toxic pit constituents leaving the pit and following a pathway to reach and contaminate groundwater. At this time, current technology would likely necessitate materials like bentonite or high density polyethylene materials as likely candidates to use to attain a low level of permeability of 10-7 cm/s.

Encouraging the reuse of reserve pit fluids can cut the total amount of wastes which need to be disposed. Identifying the contents of the drilling fluids or formation fracturing fluids and working with oil and gas companies to decrease the amounts of the more toxic chemicals used would decrease the potential for groundwater contamination. Additional monitoring of the fluids used and the amounts used or left in closed pits, or restrictions in the use of excavated pits may be necessary to ensure that risks to groundwater are minimized.

New technologies are appearing everyday which can be used to improve and protect water resources. The BLM will encourage and (in some cases) may require the use of new technologies for activities approved on BLM-administered surface lands.

Guidelines and Assumptions

Existing riparian and upland health assessments were used to analyze the potential effects of the alternatives on water quality. The analysis is also based on the professional expertise of BLM specialists.

This analysis was based on the following assumptions:

In streams that meet State Water Quality Standards and fully support their beneficial uses, the most effective and practical means of controlling nonpoint source (NPS) pollution is through the use of watershed planning and science-based BMPs.

In streams that do not meet State Water Quality Standards or that do not fully support their beneficial uses, the application of BMPs may not be sufficient to restore water quality. In these situations, the most effective and practical means of restoring water quality is through the development and implementation of science-based and locally supported water quality plans. These plans (and their associated TMDLs) identify reasonable land, soil, and water conservation practices that are expected to reduce NPS pollution and ultimately support beneficial uses. These land, soil and water conservation practices include, but are not limited to, BMPs.

Wetlands and riparian areas play a significant role in protecting water quality and reducing or eliminating many of the potential impacts of NPS pollution. One way this is achieved is by providing a buffer between uplands and adjacent water bodies. This can filter out NPS pollution before it can impact water quality. Healthy riparian areas and wetlands can also reduce NPS pollution by shading water bodies, stabilizing stream banks, and controlling erosion.

All riparian areas are evaluated according to the Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997a) and managed for PFC. Streams and wetlands that are in PFC are able to process high runoff events more effectively than those that are not functioning properly. The more surface disturbance in a watershed, the greater the probability that excess surface runoff and sediment would enter the stream or wetland and contribute to the loss of riparian and wetland functionality.

Managing uplands, riparian areas, and wetlands to be in PFC is a reasonable land, soil, and water conservation practice that increases the likelihood that these areas will not produce unacceptable amounts of NPS pollution.

Improving the condition of degraded uplands, riparian areas, and wetlands (i.e. improving trends) is a reasonable land, soil, and water conservation practice that reduces NPS pollution from these source areas.

Some surface-disturbing actions, such as vegetation management projects, could cause short-term adverse impacts to water quality immediately following treatments, but could result in long-term benefits as vegetative restoration and enhancement measures become established.

BLM authorized activities would comply with state and federal regulations, Montana/Dakotas Rangeland Health Standards, conservation agreements and Best Management Practices to protect the chemical, physical, and biological integrity of the water and riparian habitat.

The discussions of impacts on water and riparian resources from the alternatives are based on the best available data. Knowledge of the analysis area and professional judgment from observation and analysis of conditions and responses in similar areas are used to infer environmental impacts where data is limited.

Impacts Common to All Alternatives

In all cases, water resources would be protected with an oil and gas NSO stipulation, because surface-disturbing activities would be limited. Therefore, impact magnitudes to water resources resulting from increased erosion rates, changes to surface hydrology, and introduction of contaminants would decrease. Water in these areas would be protected from oil and gas, land and realty, or renewable energy surface-disturbing activities unless it is determined that the proposed action would not contribute to degradation of water quality or quantity. Closed, NSO and CSU stipulations designed to protect other resources (e.g., wildlife, soils) would generally minimize negative impacts by limiting the type, extent, and timing of surface disturbances and other potentially harmful activities. These stipulations would restrict the types and locations of surface-disturbing activities under all alternatives. Eliminating surface disturbances or only allowing activities that would not degrade water, soil, or other resources would benefit efforts to achieve or maintain PFC and other management objectives. Implementation of NSO lease stipulations for oil and gas activities in areas of flooded soils (a proxy for wetlands/riparian areas and floodplains) (see Glossary for definition of **flooded soils**) would decrease direct adverse impacts to wetlands and riparian areas under all alternatives.

All alternatives would share the goal and management objective of meeting State Water Quality Standards and improving the condition of impaired stream segments on BLM-administered land.

Air Quality: Air pollutant emissions of nitrogen- and sulfur-containing compounds, primarily from engine and vehicle sources, could affect soil quality by contributing to a minor increase in water acidity. Pollutant contributions would be greater during periods of well drilling and during facility and infrastructure construction when large non-road engines are operating and when high vehicle traffic occurs. Pollutant contributions would be lower when high-intensity activities are not occurring.

Climate: Long-term climate change would affect water resources throughout the planning area. Increased temperatures would increase evaporation rates causing relative decreases in the proportion of precipitation that ultimately infiltrates to groundwater or reaches water bodies via surface flow. Increased evaporation rates also would affect surface water bodies and lead to increased losses of water quantity, potentially resulting in an adverse effect on water quality parameters such as salinity, conductivity, pH, and turbidity. However, changes to precipitation rates and net availability of water within the planning area as a result of climate change are less certain and cannot be definitively assessed at this time.

Invasive Species, Including Noxious Weeds: Ground-disturbing activities in and around riparian areas could promote noxious weed and invasive species infestation. Many invasive and noxious weeds have relatively sparse canopies, as compared to native vegetation, which could result in increased erosion.

Use of a selective herbicide applied by a wick or backpack sprayer would minimize impacts to non-target riparian vegetation, including shrubs and trees. Applying an herbicide approved for aquatic use, or maintaining buffer widths based on herbicide and site-specific criteria between treatment areas and water bodies for herbicides not labeled for aquatic use, would be followed to minimize impacts to water bodies.

Targeting noxious weeds and invasive species in riparian zones may reduce the diversity of plant species in the short term, which could lead to accelerated erosion along stream banks. Removal of noxious weeds capable of dominating the vegetative component of riparian zones could increase the diversity of plant species in the long term and improve overall health and stability of the riparian system. Management of noxious weeds and other invasive species is anticipated to create minor to negligible, negative short-term impacts where accelerated erosion could result from a reduction in the diversity and cover of plants. This could create minimal sedimentation into streams. Long-term beneficial impacts would be anticipated

to be minor to negligible to water resources under all alternatives as improvement to the overall heath and stability of the riparian systems occurs.

Soil Resources: Short-term disturbance includes areas expected to recover through natural re-establishment of disturbed vegetation and areas that would be restored through reclamation practices. Table 4-23 displays the acreage that would receive short-term disturbance by each alternative.

Table 4-24 displays the acres that would receive long-term disturbance by each alternative. The total number of acres of surface disturbance would vary slightly between alternatives as shown in Tables 4-23 and 4-24. Short-term surface disturbance would be reclaimed fairly quickly resulting in very low acreages of long-term surface disturbance (maximum of 376 acres). This amounts to less than one-fifth of one percent of the decision area (one percent of the surface acreage would be 2,740 acres). Very few of these acres would be within 1/4 mile of streams due to stipulations and other mitigation measures, therefore providing vegetation buffers between surface disturbance and streams or other riparian areas. The surface disturbance would also occur throughout several different watersheds which would further reduce the risk that disturbed sites would adversely impact water quality. A majority of sediment transport would be mitigated through restrictions on surface-disturbing activities near surface water, which would result in no detectable impact to water quality from surface -disturbing activities for all alternatives.

Surface use stipulations designed to protect soil resources would also minimize negative impacts to water resources. See Table 4-26. Discussion of individual strategies for management of soil resources is provided in the Soil Resources section. Achieving or maintaining Standards for Rangeland Health and expertly evaluating the effects of proposed actions on soil resources would have a beneficial net effect on water resources. Maintaining and promoting adequate ground cover, plant vigor, and nutrient cycling, along with biological, riparian, and wetland functions would help maintain water quality by minimizing erosion and water resource contamination. Subsurface soil conditions that support infiltration assist in decreasing overland flow and erosion, and aid biofiltration and groundwater purification.

Projects to promote healthy and stable soils would have positive impacts on water resources by reducing potential soil erosion. This includes the reclamation of previously disturbed lands. Reduced erosion could lead to a reduction in sediment delivery and improved water quality which would be anticipated to have beneficial minor short- and long-term impacts under all alternatives. Impacts between alternatives do not vary considerably due to the small acreage of potential surface disturbance that would occur and surface use stipulations apply to all alternatives to protect soil resources.

Vegetative Communities: Rangelands comprise a majority of watershed surface area within the planning area. Rangelands also support livestock production and provide habitat for wildlife. Precipitation that falls on rangeland vegetation in the planning area is a major source of shallow aquifer recharge and surface water that ultimately joins rivers and streams flowing through and adjacent to the rangeland. Use and management of rangeland vegetation can have major adverse impacts on water resources that infiltrate the ground and flow over the land when proper mitigation measures are not used.

Managing rangelands for healthy vegetative communities by pursuing Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing (Appendix A) and rangeland health assessments would assist in achieving or maintaining PFC on upland sites. PFC includes promotion of adequate amounts of vegetative cover to stabilize soils and ensure proper overland flow characteristics. Managing for PFC on uplands, riparian areas, and wetlands increases the likelihood that these areas would not produce unacceptable amounts of NPS pollution. Generating improving trends would be important in reducing the amount of NPS pollution from these source areas. Monitoring uplands and riparian areas for PFC would provide information to assess and implement appropriate mitigation measures (if necessary) to minimize potential adverse effects on water resources.

The types and magnitude of impacts would be similar under all alternatives.

In 2007, the SDFO completed an extensive survey of riparian areas with some additional surveys completed through 2010. Riparian areas were assessed using the PFC methodology. The PFC assessments are used by the BLM and many other federal agencies to assess the condition and capabilities of riparian systems. The assessments are also used to flag areas that require more in-depth quantitative monitoring. PFC assessments were completed on 54 miles of major riparian areas on BLM-administered land within the decision area. Of the areas assessed, the study indicated that 68 percent (or 37 miles) of riparian areas on BLM-administered lands in South Dakota are in PFC. Thirty percent, or 16 miles, are Functioning at Risk (FAR) and two percent (one mile) are Non-Functioning (NF).

Achieving or maintaining Standards for Rangeland Health are generally effective in managing potential adverse effects to surface water resources. According to BLM rangeland health assessments completed since 2004, approximately 20,900 of the 260,000 acres assessed within the decision area did not meet Standards for Rangeland Health for various reasons including drought, non-native species, past land use practices, and historic or current grazing practices. Of the 20,900 acres assessed within the decision area, 4,500 acres did not meet Standards for Rangeland Health as a result of current livestock grazing (BLM 2010b). Corrective management actions have been implemented on all grazing allotments that did not meet the Standards due to current livestock grazing. Reassessment of some of the allotments not meeting standards indicates that 3,100 acres have improved and now meet the standards, leaving 1,400 acres still not meeting standards due to current livestock grazing practices.

The remaining 16,400 acres not meeting the Standards for Rangeland Health are mainly a result of introduced species such as smooth brome, noxious weeds, or cheatgrass. The major problem with introduced species is their tendency to produce monotypic stands resulting in the loss of native plant diversity. Historic livestock grazing has also shifted some plant communities past thresholds to clubmoss and blue grama dominated sites, which decreases infiltration into the soil.

Nineteen percent of all assessed lotic miles are located in the High or Moderate RFD categories depicted in Table 4-34. Approximately 13,397 acres of BLM-administered surface estate is in floodplains, of which 42 percent are within High or Moderate RFD areas. Under all alternatives, riparian vegetation in areas identified as wetlands or floodplains would be protected by NSO lease stipulations. Riparian vegetation in those areas currently classified as PFC would continue to function properly, and FAR and NF segments would likely trend toward better functioning conditions. Achieving or maintaining PFC would ultimately result in improved water quality in the planning area.

Table 4-34
Riparian Vegetation Protected through Floodplains Stipulation

	High RFD	***Moderate RFD***	***Total***
Flooded Soils (Alt A)	3,429	463	13,397
Flooded Soils, 300 ft buffer (Alt B-D)	7,306	956	30,487
Total Acres of BLM surface*	31,269	6,984	273,315
Total Stream (Lotic) Miles	8.9	1.5	54
Properly Functioning Condition (PFC)	5.7	0.3	37
Functioning At Risk (FAR)	2.9	0.9	16
Non-Functioning (NF)	0.3	0.2	1

*PFC analysis was not conducted for split-estate lands (fee surface, BLM minerals); this table only represents BLM surface lands.

The effects of mechanical vegetation treatments on water resources would depend on: 1) the area exposed by the treatment; 2) the effect of ground disturbance on soil properties; 3) site conditions, especially slope and patterns of precipitation; and 4) the vegetation response after treatment (BLM 2007c). All vegetation treatments would have some level of design criteria, stipulations, or BMPs prescribed to protect water resources. Vegetative treatments which change the vegetation structure may increase local erosion and sedimentation rates. However, most treatments would be designed to improve overall watershed condition (which includes minimizing erosion and maintaining infiltration rates). This would protect water resources in the long term resulting in a negligible impact to water resources for all alternatives.

Water Rights: The BLM would evaluate the impact of proposed projects on existing water rights of downstream users and other affected agencies and landowners prior to constructing new water developments or taking other actions that could potentially affect water quantity or quality. The BLM would apply for water rights through the State of South Dakota and water needs of downstream users would be considered on a project level (implementation) basis.

Fire Management and Ecology: Severe wildfire is detrimental to watershed function and surface water quality. Fire is potentially damaging to watershed biodiversity, reservoir water quality, plant communities, and other natural resources. By killing vegetation, burning organic matter in litter and soil, and forming impervious soil layers, severe fires can accelerate

runoff from the watershed. Bare soils and increased runoff cause greater detachment and transport of soil particles. With reduced infiltration, saturated soil conditions and shallow debris flows become more prevalent. Sediment yields increase markedly, particularly where riparian vegetation is burned. Besides the direct effects of catastrophic fires, ground disturbance related to fire suppression and post-fire activities also may adversely affect water quality and watershed function. Although total surface water yield may increase for several years following a fire in response to decreased transpiration and vegetation interception, value of the increased yield is limited and typically occurs during peak flows.

Emergency stabilization and burned area rehabilitation (ES&R) would be used to treat burned areas that pose an unacceptable risk to public safety, property, cultural resources, and/or ecological function. The ES&R would reduce post-fire erosion and sedimentation, therefore protecting water quality. ES&R is common to all alternatives as it is national BLM policy. This would result in better water quality than with a no ES&R alternative. Hazardous fuels reduction activities consist of removing or reducing the amount of vegetation on the landscape. These actions, depending on site-specific characteristics, may reduce the amount of water loss to transpiration and increase water runoff. Conducting fire management activities that occur early in the dry season may reduce adverse water resource effects as vegetation and root structures have sufficient recovery time prior to the wet season. Maintaining riparian vegetation and functional biofiltration in areas downgradient from fire management activities minimizes impacts to water quality.

Use of prescribed fire to prevent unacceptable accumulations of stubble, brush, understory, and other fire fuels in areas where low to moderate fire intensity is preferable and high intensity wildfire is avoided would have a beneficial effect on watershed functions and water quality. Factors such as intensity, duration, soil moisture, vegetation type, fuel type and density, and time of year determine the severity of impacts to the physical, chemical, and biological properties of water resources. Prescribed fire, when compared to wildfire, also may reduce chemical (phosphorous and nitrate) loading to water (Mexiner 2004). Areas that have not been severely burned typically recover in one to five years.

Groundwater availability and quality are not significantly affected by prescribed fire or by mechanical treatments, although the effects are positive. Groundwater can be significantly affected by large catastrophic wildfire, although the effects are normally small since most fires are small and vegetative communities eventually recover. The larger the acreages of prescribed fire and mechanical treatments, the more positive are the effects overall. The larger the acreages of catastrophic wildfires, the more negative the effects. In either case the effects can be significant if on a large enough scale. They also can gradually change through time due to natural plant succession, which affects water infiltration and runoff.

Wildlife and Special Status Species: Management decisions designed to protect plant and wildlife species designated as threatened or endangered under the ESA, or considered sensitive species by the BLM in the planning area, would generally have beneficial impacts to water resources. Restrictions on the type, location, or time period that certain activities are permitted would generally decrease disturbance to soils and vegetation. For example, establishing NSO buffers around sage-grouse and greater prairie-chicken leks or riparian areas would limit surface disturbance in those areas and assist in maintenance or achievement of PFC, thus protecting watershed function and water resource quality. Acres of wildlife resource restrictions are presented throughout the alternatives in Table 4-28. Species such as bald eagle, piping plover, least tern, and peregrine falcon do not nest directly on BLM-administered surface at this time.

Timing restrictions designed to protect wildlife values would not result in beneficial or adverse impacts to water quality because the restricted activities would happen at other times of the year and would have similar impacts to soil stability, surface hydrology, and infiltration rates. Restrictions on activities such as oil and gas and ROWs would protect surface water quality and quantity by providing vegetation buffers between surface disturbance and streams or other riparian areas. A majority of sediment transport would be mitigated through buffers, which would result in no detectable impact to water quality from surface-disturbing activities under all alternatives.

Enhancing wildlife habitat generally assists in improving vegetative communities toward PFC. This would result in reduced erosion throughout the planning area and therefore reduced sedimentation to streams. Wildlife management actions to improve wildlife habitat are generally expected to create minor beneficial short- and long-term impacts to water under all alternatives.

Forest and Woodland Products: Removing forest products by thinning and salable timber harvest would create short-term disturbances on an annual basis. The bare soil created by roads and removal of vegetative cover could increase erosion and sedimentation, resulting in adverse impacts to water quality through higher turbidity and TSS concentrations.

Silvicultural prescriptions (i.e., an operational plan that describes forest management objectives for an area) and contracts would be written with mitigation measures including, but not limited to, those specified in the Forestry BMPs of South Dakota summarized in Appendix B (SDDA 2003). Properly functioning watersheds that support productive plant communities consistent with site potential would likely be established in the long term.

While effects from treatment units can be minimized through the BMPs and units layout, effects from roads are more problematic. Permanent roads have the potential to create long-term sources of sediment through the erosion of the road prism. Temporary roads can produce short-term sediment increases lasting until reclamation. The amount of sediment is dependent upon the parent material/soils, road design, slope position, number of stream crossings, use, storm type and intensity, and road life. Minimizing stream crossings and avoiding high risk slopes and riparian areas often minimizes sediment production. While these practices can produce short- to long-term impacts, healthy forests can reduce sediment impacts associated with catastrophic wildfire.

Lands and Realty: Water quality would be maintained through site-specific mitigation during construction and reclamation activities. It is anticipated that within the next 20 years, ROWs would disturb a maximum of 136 acres of vegetation and soil. Of these, a maximum of 79 acres would be long-term disturbances. Underground electric lines that may require fluid cooled systems would result in an increased risk of groundwater or surface water contamination in the event of system leaks.

The acres of potential surface disturbance and therefore potential for sedimentation to surface water would be spread out across the decision area. The surface disturbance would also occur throughout several different watersheds which would further reduce the risk that disturbed sites would adversely impact water quality. The maximum 136 acres of surface disturbance would be one-twentieth of one percent of the total decision area's 274,000 acres of BLM-administered surface acres. Impacts from ROWs would therefore be negligible to surface water and groundwater across all alternatives due to the small number of acres that would potentially be disturbed.

Livestock Grazing: Streams and ponds are particularly vulnerable to impacts caused by livestock grazing. Erosion by water may be accelerated if insufficient litter or plant cover is left after the grazing season, or if plant composition is changed by grazing practices. Achieving or maintaining Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management, along with PFC assessments on uplands, riparian areas, and wetlands, generally are productive in managing potential adverse effects of livestock grazing on water resources.

However, according to BLM rangeland health assessments completed since 2004, approximately 4,500 acres of the 260,000 upland acres assessed within the decision area did not meet Standards for Rangeland Health as a result of livestock grazing (BLM 2010b). Reassessment of some of the allotments not meeting standards indicates that 3,100 acres have improved and now meet the standards, leaving 1,400 acres still not meeting standards due to livestock grazing. The improved upland conditions should result in improved surface water quality.

Corrective management actions have been implemented on all allotments that did not meet the Standards due to livestock grazing, and these actions are anticipated to have moderate short- and long-term beneficial impacts to water resources.

In 2007, the SDFO completed an extensive survey of riparian areas with some additional surveys completed through 2010. Riparian areas were assessed using the PFC methodology. The PFC assessments are used by the BLM and many other federal agencies to assess the condition and capabilities of riparian systems. The assessments are also used to flag areas that require more in-depth quantitative monitoring. PFC assessments were completed on 54 miles of major riparian areas on BLM-administered land within the decision area. Of the areas assessed, the study indicated that 68 percent (or 37 miles) of riparian areas on BLM-administered lands in South Dakota are in PFC. Thirty percent, or 16 miles, are Functioning At Risk (FAR) and two percent (one mile) are Non-Functioning (NF).

Roughly four miles of stream reaches on BLM land are FAR with grazing management issues. A majority of these four miles occur along two of the major rivers in western South Dakota (Cheyenne and Little Missouri). The Cheyenne River and Little Missouri River are listed as impaired 303(d) streams with probable impairment types of TSS, specific conductance, salinity, alkalinity, and fecal coliform (Table 3-8. Probable impairment sources are crop production, riparian grazing, wildlife, and natural sources. Natural erosion of highly erosive shale derived soils along stream banks is a major contributor of TSS.

In areas where the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management are not followed, overgrazing and trampling could eliminate riparian vegetative cover, resulting in increased soil erosion and sedimentation. Increases in nonpoint source pollution and loss of channel and streambank stability can deteriorate water quality and diminish the ability of ecosystems to maintain healthy aquatic communities locally and across the watershed (BLM 1997b; BLM 1997c; Bengeyfield 2006).

Stream conditions characterized by livestock grazing that is not meeting the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management may include unstable and eroded banks, sedimentation, buried or embedded rock substrates, loss of riparian vegetative cover and associated organic matter inputs, increased width-to-depth ratio, reduced current in shallow water, and reduced wildlife habitat structure. Water resources may be degraded by increased nutrient enrichment, increased algae growth and fecal coliform concentrations, reduced dissolved oxygen, and higher temperatures.

To minimize water quality impacts resulting from nonpoint source pollution including livestock grazing, Section 319 of the Clean Water Act requires that nonpoint sources are assessed and BMPs are developed to improve water quality. Managing livestock grazing to meet the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management would provide an improving trend on the four miles of stream in FAR with grazing management issues and the 1,400 acres not meeting standards due to livestock grazing. This would suggest that banks are healing and riparian vegetation is becoming established which would result in decreased sediment produced from BLM-administered lands. It also implies that livestock are spending less time in or immediately adjacent to the streams which would reduce the delivery of a number of pollutants (i.e., sediment, nutrient, and bacteria) thereby improving water quality.

Considering that BLM-administered lands represent a total of around three percent of the almost 800 miles of 303(d) listed stream segment reaches that BLM-administered lands come into contact with, there would likely be negligible impacts to surface water resources. This reduced sediment production from BLM-administered lands would likely not show up as an improved condition for 303(d) listed streams due to the small percentage of land that the BLM represents. An improving trend on BLM-administered land would imply an improving trend on surrounding private land as the BLM-administered land regularly makes up a small percentage of the land ownership within a given pasture.

Livestock supplements such as salt, minerals, and protein would be restricted from riparian areas under all alternatives. This would encourage livestock to concentrate away from water sources and improve water quality under all alternatives by reducing direct deposition of feces into the stream and moving high concentration areas away from riparian areas.

Range improvement projects that divert livestock away from riparian areas and stream corridors would also benefit water resources. One water pit/reservoir is anticipated to be built every other year and would serve to focus livestock activities away from riparian zones and natural water bodies.

Minerals – Fluid: Approximately 1.7 million acres of federal oil and gas mineral lands are within the planning area. Fluid minerals (i.e., hydrocarbon oil and gas) are considered to have high potential for RFD on approximately 113,500 acres in the planning area and moderate RFD potential on approximately 80,500 additional acres. Development would occur over 15 to 20 years and could affect water resources during exploration, drilling, production, and abandonment. Most potential effects to water resources from fluid mineral development would exist in High and Moderate potential RFD areas where the density of wells and related facilities is higher and where lease spacing makes it more difficult to relocate wells and associated infrastructure away from riparian areas.

Indirect impacts to water resources may result from surface disturbances during well pad and access road construction and use (e.g., vegetation removal, soil exposure, mixing of soil horizons, topsoil productivity loss, soil compaction, and increased susceptibility to erosion). The approximate total disturbed surface acreage associated with well site, access road, and pipeline construction is listed in Table 4-23. Well pads would undergo interim reclamation during production, stabilizing soils and minimizing runoff and sedimentation. Pipeline corridors would be reclaimed after installation. Soil and vegetation productivity would be limited on access roads and production areas, and an elevated potential for water resource impacts due to changed erosion rates and increased sedimentation would occur.

Access roads, facilities, and areas needed for production would require long-term removal of soil and vegetation productivity which would otherwise maintain water resource quality. Areas may remain non-productive and continue to be at risk of erosion until abandonment and final reclamation. Production water, when spilled, could contaminate soils and

impact surface and groundwater quality. Areas not needed for active production and operation would undergo interim reclamation as soon as possible after disturbance and continue until final reclamation is achieved unless the BLM determines this to be unnecessary to protect water quality. Generally, erosion rates are greater on recently reclaimed areas and decrease to natural levels in about three to five years.

Surface occupancy and use restrictions, site-specific mitigation measures (Appendix D), BMPs (Appendix B), and reclamation standards (Appendix C) would be implemented and monitored to minimize potential adverse effects to water resources. The BLM Gold Book, Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (BLM 2007b) would be followed by operators.

Additionally, the wide variety of chemicals used during oil and gas operations may be introduced to surface water and groundwater through multiple potential pathways. Drilling operations (including water production and storing drilling wastes in reserve pits) and hydraulic fracturing, in particular, are potential activities that could create contamination during operations and post-closure (see Chapter 3, Water Resources). Other types of wastes created during fluid mineral development besides produced water and drilling wastes can present potential contamination sources, including oily soil, produced solids, production pit and sump waste, and pigging (pipeline) waste. Glycol dehydrator drip pits may contain water with dissolved hydrocarbons, including BTEX (benzene, toluene, ethylbenzene, and total xylenes) and metals such as arsenic, barium, cadmium, chromium, and lead. Workover (major maintenance and repair operations) fluids may include strong acids used for scale removal and corrosion inhibitors containing zinc carbonate and aluminum bisulfate (OGAP 2004).

Produced water from oil and gas (non-coalbed methane) wells typically contains elevated concentrations of hydrocarbons and chemical additives (see Table 3-7) and cannot be safely discharged to surface waters. Most produced water is re-injected into deep aquifers that are not used for domestic or agricultural uses. In 2006, oil and gas operations created approximately 8 million barrels (approximately 336 million gallons or slightly more than 1,000 acre-feet) of produced water in South Dakota (USEPA 2008a). Due to the high volume of groundwater in South Dakota aquifers (Table 3-7), injection of this volume of produced water would be expected to have minor to negligible, short- and long-term adverse effects to groundwater resources. Spills of produced water from haul truck-related accidents are unlikely, but would have moderate short-term adverse impacts to local surface water quality, including possible threats to aquatic life and vegetation if the spill were to reach a surface water body (Veil, et al. 2004).

Well drilling and completion activities present numerous potential pathways for contamination of water resources. One of the most widespread problems is the loss of drilling fluid circulation and release of fluids into aquifers. Typically, drilling mud coats the borehole, preventing fluid loss to the surrounding rock; however, in very porous formations (i.e., karstic limestones), significant volumes of drilling fluid may enter the formation before it is effectively sealed from the borehole. If the pore space is occupied by water, major aquifer contamination can occur. South Dakota regulations require that the upper 100 feet of a borehole (at minimum, except where waived by the Secretary of the Department of Environment & Natural Resources) be drilled with fresh water to eliminate introduction of drilling wastes into shallow groundwater, provided that the surface casing cement maintains integrity.

In the planning area, this problem is most likely to occur when wells are drilled to target the Minnelusa or Red River Formations. Well bores drilled into these formations would pass through more aquifers than shallower wells completed in Cretaceous-age oil and gas reservoirs. Because most wells drilled in north Harding County target the Red River Formation, these wells are at risk of impacting multiple groundwater aquifers. Wells drilled in Fall River and Custer counties may impact the Minnelusa and overlying aquifers. Shallow gas wells drilled to Upper Cretaceous reservoirs in southern Harding and northern Butte counties are not likely to impact groundwater resources through loss of drilling fluids; however, these shale and sandstone gas reservoirs may require hydrological fracturing to stimulate production.

In general, because drilling fluids (including water, mud, cuttings, additives) contain high concentrations of organic carbon, total nitrogen, phosphorous, solids, chemical oxygen demand and metals, they are considered pollutants (USEPA 1981). Common drilling mud constituents present in reserve pits are listed in Table 3-7. Introduction of some of these constituents would have the potential to adversely impact surface and groundwater quality. Many of these constituents are considered to have mild or innocuous health hazards; however, in sufficient quantities they could impact water quality (i.e., total suspended solids, turbidity).

On the other hand, some constituents can have extremely detrimental effects, such as acute primary toxicity and endocrine disruption. The potential hazard of each constituent depends on the following factors: acute/chronic/ sublethal data for each constituent; extent of dispersion and dilution in the discharge plume; proportion of each constituent to the volume of mud discharged; and the constituent's chemical nature and association with other constituents in the drilling fluid (Kanz and Cravey 1987). Based on those factors, thinning agents used in large amounts present a significant hazard in most drilling fluids. Likewise, corrosion inhibitors are highly toxic and their chemical dissociation in surface and groundwater is harmful. Biocides, although the most toxic individual drilling component, present little potential hazard because their use is regulated by the federal government to very small volumes. Formaldehyde and paraformaldehyde used in oil field applications are considered to "pose little adverse risk to non-target organisms or listed species" (USEPA 2008b). Viscosifiers (i.e., bentonite), weighting agents (i.e., barite), and filtration controllers have moderate to low toxicity but are used in large quantities and persist in the environment longer than other components (Kanz and Cravey 1987).

Many drilling mud constituents have some toxic effect on plant and/or animal species. For example, chrome-lignosulfonate may be moderately toxic to marine animals (Neff 1987, Parrish, et al. 1989). Barite, the primary drilling mud weighting agent, contains significant levels of heavy metals (i.e., arsenic, lead, cadmium, mercury, and copper) that contribute to drilling fluid toxicity (Rae 2004 PowerPoint). Although metals may be present, they are typically not available for bioaccumulation because they occur in insoluble forms within the barite (Neff 2010). Ionic strength of groundwater and the potential for dissolution of metal-containing sulfide mineral inclusions in barite increases with depth within the planning area as brine (salt-rich) groundwater is encountered.

Various hydroxide compounds are utilized during oil and gas drilling operations. Sodium hydroxide (caustic soda) and potassium hydroxide (caustic potash) are used to maintain drilling fluid pH and alkalinity. In addition to being highly hazardous (caustic) to handle, introduction of these chemicals to surface or shallow groundwater can be highly detrimental to water quality and aquatic life.

Diesel fuel oil (American Society for Testing and Materials #2 diesel) may be used as a drilling fluid additive in the Williston Basin portion of the planning area. The acute toxicity of drilling fluids containing petroleum additives (including diesel fuel oil) increases as hydrocarbon concentration increases (Neff 2010). (Also see Chapter 3; Water Resources, Oil and Gas Drilling, for more discussion.)

Hydraulic fracturing is a standard treatment for stimulating oil and gas well productivity in tight reservoirs. The process consists of pumping a viscous fluid containing a propping agent into a wellbore at high pressure to create and stabilize fractures that extend from the wellbore into the target oil or gas formations. Fracturing fluids and the conditions for their use are summarized in Table 4-35. The chemical additives of the fluid are summarized in Table 4-36. The ideal products for propping open the fracture (known as proppants) once the pumps are shut down and the fracture begins to close are silica sand, resin-coated (epoxy) sand, and ceramics.

Table 4-35
Fracturing Fluids and Conditions for Use

Base Fluid	***Fluid Type***	***Main Composition***	***Use Conditions***
Water Based	Linear Fluids	Gelled Water, GUAR<HPG, HEC, CMHPG	Short Fractures, Low Temperatures
	Crosslinked Fluids	Crosslinker + GUAR, HPG, CMHPG, CMHEC	Long Fractures, High Temperatures
Foam Based	Water Based Foam	Water and Foamer + N2 or CO2	Low Pressure Formations
	Acid Based Foam	Acid and Foamer +N2	Low Pressure, Water Sensitive Formations
	Alcohol Based Foam	Methanol and Foamer +N2	Low Pressure Formations with Water Blocking Problems
Oil Based	Linear Fluids	Oil, Gelled Oil	Water Sensitive Formation, Short Fractures

Table 4-35 Fracturing Fluids and Conditions for Use			
Base Fluid	***Fluid Type***	***Main Composition***	***Use Conditions***
	Crosslinked Fluids	Phosphate Ester Gels	Water Sensitive Formation, Long Fractures
	Water External Emulsions	Water + Oil + Emulsifier	Good for Fluid Loss Control

Table 4-36 Fracturing Fluid Chemical Additives		
Type of Additive	***Function Performed***	***Typical Products***
Biocide	Kills Bacteria	Gluteridehyde Carbonate
Breaker	Reduces Fluid Viscosity	Acid, Oxidizer, Enzyme Breaker
Buffer	Controls the pH	Sodium Bicarbonate, Fumaric Acid
Clay Stabilizer	Prevents Clay Swelling	KCl, NH4CL, KCl Substitutes
Diverting Agent	Diverts Flow of Fluid	Ball Sealers, Rock Salt, Flake Boric-Acid
Fluid Loss Additive	Improves Fluid Efficiency	Diesel, Particulates, Fine Sand
Friction Reducer	Reduces the Friction	Anionic Copolymer
Gel Stabilizer	Reduces Thermal Degradation	MEOH, Sodium Thiosulphate
Iron Controller	Keeps Iron In Solution	Acetic & Citric Acid
Surfactant	Lowers Surface Tension	Fluorocarbon, Nonionic

Source: EPA 2004.

Fracturing fluids may contain toxic, hazardous and carcinogenic materials including BTEX, polycyclic aromatic hydrocarbons (PCHs), naphthalene, methanol, sodium hydroxide, and methyl tert-butyl ether (MTBE), as well as a variety of metals (USEPA 2004).

A majority of fracture treatments are pumped for the following reasons:

- Increase the flow rate of oil and/or gas from low permeability reservoirs,
- Increase the flow rate of oil and/or gas from wells that have been damaged,
- Connect the natural fractures and/or cleats in a formation to the wellbore,
- Decrease the pressure drop around the well to minimize sand production,
- Decrease the pressure drop around the well to minimize problems with asphaltine and/or paraffin deposition,
- Increase the area of drainage or the amount of formation in contact with the wellbore, and
- Connect the full vertical extent of a reservoir to a slanted or horizontal well.

Engineers design fracturing operations using computer models that take into account the physical and chemical properties of the rock, fluids contained within the rock, and the mechanical condition of the well. The geology of the planning area offers protection from groundwater contamination because groundwater that furnishes drinking or agricultural water typically is separated from gas and oil reservoirs by hundreds to thousands of feet and by impermeable layers.

The Environmental Protection Agency (EPA) studied hydrological fracturing of wells extracting gas from coalbed methane and concluded that no adverse impacts to the quality of water in nearby drinking water wells has occurred (USEPA 2004). However, due to continued controversy and complaints, the EPA has completed a “Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources” (USEPA - November 2011). It will include retrospective case studies at five sites across the US. A determination will be made on the presence and extent of drinking water resource contamination as well as whether hydraulic fracturing contributed to the contamination. A first report of research results will be completed in 2012. This first report will contain a synthesis of EPA’s analysis of existing data, available results

from retrospective cases studies, and initial results from scenario evaluations, laboratory studies, and toxicological assessments. Certain portions of the work, including prospective case studies and laboratory studies, are long-term projects that are not likely to be finished at that time. An additional report in 2014 will synthesize the results of those long-term projects along with the information released in 2012.

Fracture fluid volumes, injection pressures, and production zone depths are significantly different between shallow coalbed methane wells, as analyzed in the 2004 EPA study, and the tight sand and shale reservoirs of the Williston Basin. Although the presence of thick confining units between fracture zones and aquifers within the planning area are anticipated to provide protection from migration of gas and fracture fluids upward into groundwater aquifers, the probability of contaminants reaching aquifers cannot be determined.

In naturally fractured or cleated formations such as gas shales or coal seams, it is possible that multiple fractures can be created and propagated during a hydraulic fracture treatment. Hydraulic fracturing can open up pathways for fluids or gases from geologic layers to flow where they are not intended, which presents an opportunity for groundwater contamination. Surface water resources could experience adverse effects if fluid fracturing chemicals and wastewater leak or spill from the wellbore, flowlines, trucks, tanks, or pits.

In limestone and dolomite reservoirs (i.e., Red River Formation), injecting acid into the formation is used to increase reservoir porosity and permeability enabling greater hydrocarbon production. Hydrochloric acid is typically used for this technique in one of two ways. During acid fracturing, the formation is hydraulically fractured, as described above. However, instead of using propping agents, acid is injected into the induced fractures to widen them so fluid flow pathways are maintained after the pumps are turned off. The second method (acidizing) involves injecting acid into the formation with the goal of enhancing naturally-occurring porosity. The amount of acid used for these treatments varies, but is usually on the order of 5,000 to 10,000 gallons per well for completions in the Red River Formation (Luff 1998; MTU 2003). Injection of large volumes of acid is somewhat mitigated by the neutralizing effect that occurs as carbonates are dissolved. In addition to potential impacts on groundwater pH, acid treatments may mobilize metals during dissolution (OGAP 2005).

Potential effects to water resources are both short- and long-term. NSO lease stipulations in areas of floodplains would apply under all alternatives and would provide protection to wetland and riparian areas and protect against introduction of contaminants to surface and groundwater. NSO lease stipulations covering areas of floodplains make up a small proportion of the overall High and Moderate RFD areas. Enforcement of the NSO would likely have little impact on the accessibility of fluid minerals for development.

Impacts to groundwater are difficult to predict, especially in areas where hydrologic fracturing is commonly utilized. Groundwater impacts resulting from fluid mineral development activities are anticipated to be minor to moderate for all alternatives, but could be severe under the worst case scenario (i.e., borehole failure, aquifer cross-contamination).

Leasable mineral surface use stipulations restricting the use of surface reserve pits have been determined to be only appropriate to apply at the project level, or application for permit to drill stage. Appendix E.9 should be referenced for possible conditions of approval to be used to mitigate potential site degradation and contaminant infiltration into groundwater. Short- and long-term adverse impacts to groundwater are unknown, but are anticipated to be negative if unmitigated. Impacts to shallow groundwater would be greatest, with expected lesser impacts to deeper groundwater.

Minerals – Other Leasable: No water resource impacts are anticipated from coal, geothermal, or other mineral leasing in the planning area. That said, no further geothermal development is anticipated to occur in the foreseeable future.

Minerals – Locatable, Leasable, and Salable: Water is a solvent that can break down and dissolve many substances such as rock, minerals, and concentrated fluids. Organic compounds and inorganic elements can be attracted to the ionic charge of a water molecule and can be easily transported. Minerals present in water are known as dissolved solids. Water in motion has kinetic energy and is capable of carrying larger particles via suspension or saltation.

Solid mineral exploration and development has the potential to increase erosion and sedimentation which could lead to increased concentrations of dissolved and suspended solids in surface and groundwater. Bentonite surface mining activities would create increased erosion rates during removal, storage, and replacement of soils during extraction of solid minerals and mining infrastructure construction. Natural drainage patterns can be temporarily disrupted, and surface water may not be capable of infiltrating compacted soil or exposed bedrock. Overland flow can increase and lead to rill and gully

development which induces increased sediment transport to streams. Erosion and sediment transport potential is highest immediately following surface-disturbing activities and can remain high until final site stabilization and revegetation are completed.

Groundwater quality may be affected by water infiltration at a solid mineral removal site or by contaminated runoff leaving the site and contacting groundwater downgradient. Springs may be exposed by excavations and then produce volumes of water that may erode or become polluted. Interception or diversion can adversely affect water resources and watershed function while introduction of substances (or certain forms of energy such as heat) can physically and/or chemically alter water. When water quality is impaired, it may not be suitable for beneficial use. And, when water is not available in required or accustomed quantities at pre-mining points of use, social and biological issues may arise.

Water that percolates through contaminated material can become polluted. Water contamination problems are most often due to several pollutants residing in a waste water stream. Mining-related contaminants include: organic reagents, dissolved solids (soluble salts), oils, anions and cations, cyanides, suspended solids, acids and alkalis, turbidity, base metals, thermal influences, fluorides, and radioactivity. Possible combinations of these pollutants comprise five major problems: acid mine drainage (AMD), alkaline and saline mine drainage, heavy metal pollution, eutrophication, and deoxygenation.

AMD is a term commonly used to describe leachate, seepage, or drainage affected by the natural oxidation of sulfide minerals contained in rock exposed to air and water as a result of mining activity. The reactive sulfide minerals, in combination with oxygen and water, create sulfuric acid. Natural biological activity often accelerates oxidation reaction responsible for the formation of AMD. AMD and heavy metal pollution can adversely impact ground and surface water quality. Commonly mined ores that pose significant AMD risk are gold, silver, copper, iron, zinc, lead, and coal. Although coal, copper, and other mineable minerals are present in the planning area, there is little or no interest in developing these resources. Therefore, no water resource impacts are expected to occur.

Release of contaminated waters into the environment must be in compliance with the Clean Water Act, Safe Drinking Water Act, Endangered Species Act (ESA), and other applicable federal and state environmental laws. Authorization must be consistent with the BLM's multiple use responsibilities under the Federal Land Policy and Management Act (FLPMA) and fully reviewed in an appropriate NEPA document. Therefore, no adverse impacts to surface or groundwater would result.

Bentonite mining is expected to be the most intensive locatable mineral mining activity in the decision area Table 4-33). (Bentonite development could potentially occur over approximately 8,483 acres within the decision area and 1,508 acres of BLM-administered surface. However, only 289 acres of BLM-administered surface estate and 1,292 acres of federal mineral estate are likely to be mined. Approximately 78 acres of sensitive soils are likely to be affected by bentonite mining on BLM-administered surface estate and 348 acres on federal mineral estate. Additional sensitive soils could be impacted by the Shear-Clarkson Bentonite Mine that was approved in 2008. Mining claims are permitted in 20-acre parcels, and some portions of a claim may not contain valuable bentonite deposits. Under normal circumstances, 30 percent of lands claimed and permitted are actually mined. Lands outside mined areas may be disturbed from use of haul roads, equipment movement, and other activities. Reclamation efforts would occur concurrently with mining activity, and no more than 100 acres would remain exposed at any one time.

Areas affected by surface disturbances would be susceptible to increased rates of erosion due to direct disturbance and indirectly through changes in surface flow patterns. Also, because surface mining would expose less permeable bedrock by removal of overburden, overall runoff quantity and velocity from mined areas would increase unless mitigated. Changes to runoff patterns, quantity, and velocity are anticipated to increase erosion and sediment loading in nearby watersheds. Compliance with federal and state stormwater discharge regulations, including implementation of site-specific Stormwater Pollution Prevention Plans (SWPPPs) would keep surface water impacts to minor or negligible levels.

Infiltration to groundwater aquifers from soil removal and overburden at bentonite mines is not anticipated to increase. Bentonite deposits likely to be developed are within the Cretaceous Mowry Shale and Belle Fourche Formations. Both of these formations are marine shales with low permeability; therefore, additional exposure resulting from overburden and bentonite removal would not increase the ability of contaminants to infiltrate into groundwater. Under all alternatives, adverse impacts to groundwater as a result of bentonite mining would be negligible.

Recreation: Recreational use may result in soil, vegetation, and water resource disturbances. Greatest disturbance would likely occur in areas of concentrated use such as roads, hiking trails, and campgrounds (dispersed or developed). These disturbances could result in localized vegetation disruption, soil compaction, erosion, and sedimentation that could adversely affect water resources depending on use and duration. Recreational gold panning, dispersed and developed camping, and group permits could produce minor adverse, short-term impacts to water resources under all alternatives.

Renewable Energy: Water resources could be impacted when soils and vegetation are affected by wind and solar energy development. Alternative energy site location characteristics would determine the degree of effects. Local soil compaction and erosion may occur along roadways which could increase overland flow and concentration of dissolved and suspended sediments. A large portion of the short-term impacts are directly related to turbine work areas and material staging sites. These areas would be reclaimed and do not show up as long-term impacts. The maintenance of the chemical, physical, and biological integrity of water resources in and around wind turbines, solar farms, and associated facilities to surface water from soil erosion and corresponding sedimentation under all alternatives would be negligible.

Surface use stipulations for renewable energy would vary between alternatives. Acres protected by surface use restrictions to renewable energy are shown in Table 4-31.

Renewable energy development under Alternatives B and D would be subject to 14,191 acres of avoidance restrictions designed specifically to protect water resources with the same acres subject to exclusion areas in Alternative C, Table 4-27. Renewable energy development under Alternative A would not be subject to these avoidance and exclusion area lease stipulations. The impacts to water resources would remain negligible across all alternatives due to the small number of acres that would potentially be disturbed. Impacts to groundwater are anticipated to be negligible under all alternatives.

Special Designations: Existing and proposed special management areas, ACECs and SRMAs, provide management constraints such as NSO, or closed to leasing or mineral entry. These constraints all limit potential surface-disturbing activities and introduction of foreign materials preventing degradation of surface and groundwater quality in and around special management areas. Proposed special designations would minimize negative short- and long-term effects to water for all alternatives.

Travel Management: Cross-country (off-road/off-highway) vehicle traffic can change the speed, timing, quantity, and quality of water moving across the landscape. These roads/trails are not designed with proper drainage and erosion control measures and can be substantial sources of sediment to streams. Off-highway vehicle (OHV) use can also damage, disrupt, and compact soil stabilizers including macrofloral elements (plants), microfloral elements (lichen, fungal, and algal crusts), and inorganic elements (soil crusts). Long-term adverse impacts to water resources, including decreased water infiltration and increased runoff that prompts erosion, can commence when the force of rolling wheels disrupts and compacts soil stabilizers. Modifications to surface hydrology and streambank stability by travel on roads and trails would occur at areas where roads or trails cross drainages. Streambanks and channels would be altered, and sediment input to streams may increase at these crossings as a result of vegetation and soil disturbance. Vegetation removal at stream crossings could leave streambanks vulnerable to excessive erosion. The closer a road is to a stream channel, the greater the potential for road-derived sediments and other pollutants to reach the channel system. By generating overland flow and relatively impermeable surfaces and cutslopes, roads serve to increase sediment transport efficiency. As discharge increases within a stream network, so does the energy available for in-channel erosion, which affects stream stability and sedimentation (USFS 2003). Creation of cutslopes also serves to intercept subsurface flow (interflow), converting interflow to surface flow. Anywhere these surface flows are continuous between roads and streams, the road generating or receiving the runoff is considered hydrologically connected to the stream network (Furness, et al. 2000).

Impacts to water resulting from soil erosion and sediment transport are most likely to occur within the Exemption Area near the towns of Lead and Deadwood. Users entering or leaving the Exemption Area to access popular OHV trails in the Black Hills National Forest create illegal cross-country travel on BLM-administered land. This travel can lead to new user-created roads that often occur on steep slopes, remove vegetation, cause soil erosion and/or compaction, and concentrate water runoff within ruts and gullies (BHNF 2010). Similar impacts could occur in the Cheyenne River Breaks (Two Rivers) area north of the town of Wall, but are less likely there because access is difficult. Water resource impacts would be most significant where user-created roads cross perennial, intermittent, or ephemeral drainages.

Cross-country travel by BLM lease/permit holders is allowed if travel is directly related to administration of a grazing lease or other permitted use and provided that resource damage does not occur. Normally, cross-country use associated with

these activities does not result in new routes being created. An exception occurs when repeated travel to a new range improvement such as a stock tank or reservoir occurs. This is anticipated to create minor to negligible short- and long-term impacts to water resources. Cross-country travel with non-grazing permitted uses is normally limited and is expected to be limited in the future.

OHV use introduces gasoline and motor oil capable of contaminating soil and water as a result of emissions, inefficient combustion, and accidental spills. Oil, lubricants, and other undesired chemicals may adversely affect water quality if vehicles ford stream crossings deep enough to dislodge or wash off grimy undercarriages, transmissions, or engines.

Undesirable noxious weeds and non-native invasive species can hitchhike on vehicle undercarriages and adversely affect water resources by altering rangeland or riparian vegetation community structure and soil resistance to erosion. For these potential effects see the Vegetative Communities section, Impacts Common to All Alternatives, Invasive Species, Including Noxious Weeds.

The Exemption Area, Center of the Nation, and Fort Meade Recreation Area ACEC/SRMA are identified Travel Management Areas (TMAs) in this RMP/EIS; however, no site-specific route designations of individual routes would be made. Therefore, travel and transportation management plans that define designated motorized and non-motorized transportation networks would need to be developed after completion of this RMP/EIS. An interdisciplinary team, as well as the RMP cooperating agencies, would be used for special expertise in identifying resource and use conflicts and benefits of various routes. Possible elements for route selection criteria may include riparian areas and sensitive soils. Public involvement, as required through the NEPA process, would be conducted at the implementation level. Because route designations have not been made, impacts to water resources are difficult to analyze. However, the interdisciplinary process is expected to help ensure that harmful impacts to water resources resulting from travel management actions would be minor in the short and long term under all alternatives.

Impacts under Alternative A (Current Management)

Tables 4-26 and 4-27 present the oil and gas stipulations as well as ROW restrictions for soil and water resources, respectively. These resource use restrictions are also posted for reservoirs with fisheries in Table 4-28.

Areas subject to NSO lease stipulations designed specifically to protect water resources under Alternative A include restrictions on floodplains and slopes over 30 percent. NSO lease stipulations of 1/4 mile around reservoirs with fisheries would also limit impacts to water resources.

No ROW restrictions are identified for soil or water resources in current management under Alternative A.

Soil Resources: Under Alternative A, approximately 8,575 acres of BLM-administered surface lands would be covered by CSU stipulations in areas with slopes greater than 30 percent (Table 4-26). This alternative would provide the least protection against excessive soil erosion and degradation as Alternative A only applies to oil and gas activities while the other alternatives apply restrictions to oil and gas, renewable energy, and ROWs, resulting in fewer acres of restrictions for Alternative A. The stipulations under Alternative A would still provide protection to soil resources, therefore minimizing potential erosion which could lead to a reduction in sediment delivery to streams and maintain water quality. The level of maintained water quality would be considered less than the other alternatives as a result of fewer restrictions. Beneficial minor short- and long-term impacts would remain as discussed under Impacts Common to All Alternatives.

Fire Management and Ecology: Treated areas that meet the desired long-term future condition would contribute to properly functioning watersheds while the risk of catastrophic wildfires across treated acres would be reduced. Impacts to surface water resources would be reduced by restricting use of heavy equipment and OHVs to existing roads and trails during rehabilitation. Heavy equipment use would also be specifically restricted from use in riparian areas, streamside zones, and the Belle Eldridge repository. Treatments and management activities are anticipated to have negligible to minor adverse, short-term impacts to water resources as a result of surface disturbances and minor beneficial, long-term impacts to water quality by contributing to properly functioning watersheds.

Wildlife and Special Status Species: Short- and long-term impacts to water would remain minor beneficial as discussed under Impacts Common to All Alternatives. Acres of wildlife resource restrictions are presented throughout the alternatives in Table 4-28.

Forest and Woodland Products: Forest and woodland products would be managed to benefit water resources and offered for sale when they have an economic value. The Probable Sale Quantity of forest and woodland products would be 7,000 tons per year. Short- and long-term impacts to water resources resulting from resource use activities are anticipated to be minor.

Lands and Realty: Impacts would remain negligible as discussed under Impacts Common to All Alternatives. ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 5,522 acres are excluded from ROW development in the Fort Meade ACEC/SRMA (Table 4-29).

Livestock Grazing: Current management allows grazing on 271,000 acres. While most effects would be similar to Impacts Common to All Alternatives, there is some increased risk due to the lack of capability requirements on steeper slopes and erodible soils for new grazing allotments within the Exemption Area. This could allow some riparian and aquatic conditions to deteriorate where livestock grazing on new allotments in the Exemption Area would concentrate on the bottoms of drainages where riparian areas exist. Following the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management would limit the additional impacts to water resources.

Minerals – Fluid: Fluid mineral development would affect water during exploration, drilling, production, and abandonment, as described under Impacts Common to All Alternatives. Approximate total disturbed acreage associated with construction of well sites, access roads, and pipelines is listed in the Oil and Gas RFD (Table 4-5). Well pad and pipeline interim reclamation would occur during production, thereby stabilizing soils and returning productivity. A long-term commitment of soils would be required for access roads and production areas. Soil and vegetation productivity would be severely limited in those areas.

Under Alternative A, 6,894 acres would be closed to fluid mineral leasing, and 15,489 acres and 2,954 acres would be open to leasing while subject to NSO and CSU stipulations, respectively. Water resources would be protected on these acres because fluid mineral surface-disturbing activities and occupancy would not be allowed, and in the case of CSU engineering and reclamation plans would be prepared (Table 4-30).

Alternative A would provide the lowest level of protection to surface water resources from fluid mineral development activities when compared to the other alternatives. Impacts to surface water, particularly in High and Moderate RFD areas would be moderate in the short term. Impacts would include increased sedimentation due to erosion of newly created roads and well locations, as well as higher total dissolved solids from newly exposed rock formations. BMPs as well as the implementation of regulations requiring that surface waters meet State Water Quality Standards would reduce the long-term impacts to minor to moderate, and at times high on some difficult soils.

Renewable Energy: As shown in Tables 4-23 and 4-24, approximately 924 acres of short-term and 231 acres of long-term surface disturbance are expected to result from renewable energy development activities under Alternative A. Impacts to water resources would remain negligible as discussed in Impacts Common to All Alternatives. Renewable energy ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 5,522 acres are excluded from ROW development in the Fort Meade ACEC/SRMA (Table 4-31).

Special Designations: The restrictions and other actions associated with the Fossil Cycad and Fort Meade ACECs would limit impacts to water resources in these areas.

Impacts under Alternative B

Areas subject to oil and gas lease stipulations designed specifically to protect water resources under Alternative B include NSO restrictions on riparian areas, floodplains, wetlands and waterbodies, and areas within 300 feet of these features. Alternative B would provide an NSO restriction in areas within 1/4 mile of reservoirs with fisheries and CSU stipulations

on slopes over 25 percent and sensitive soils. ROW restrictions identified for soil or water resources under Alternative B include avoidance areas on slopes over 25 percent, sensitive soils, floodplains, and reservoirs with fisheries. See Tables 4-26, 4-27, and 4-28.

Soil Resources: Under Alternative B, approximately 14,061 acres of BLM-administered surface would be covered by CSU stipulations in areas with slopes greater than 25 percent and 39,230 acres where sensitive soils are present (Table 4-26). The stipulations under Alternative B would still provide protection to soil resources, therefore minimizing potential erosion which could lead to a reduction in sediment delivery to streams and maintain water quality. The level of maintained water quality would be considered more than Alternative A, the same as Alternative D, and slightly less than Alternative C. Beneficial minor short- and long-term impacts would remain as discussed under Impacts Common to All Alternatives.

Fire Management and Ecology: Mechanical treatments and management activities such as prescribed fire to enhance healthy forest conditions and to restore desired ecological conditions of rangelands would create greater levels of short-term adverse impacts as described in Alternative A. Meeting measurable landscape level objectives for other resources via prescribed burning would provide greater beneficial long-term impacts to water resources than under Alternative A by reducing severity of wildland fires and post-fire erosion into streams.

Wildlife and Special Status Species: Short- and long-term impacts to water would remain minor beneficial as discussed under Impacts Common to All Alternatives. Acres of wildlife resource restrictions are presented throughout the alternatives in Table 4-28.

Forest and Woodland Products: Forest and woodland products would be managed as under Alternative A, with the addition of potential treatment of products with no economic value; increased treatments (including chemical treatments) could produce higher impacts to water quality than under Alternative A. Construction of permanent roads would change the surface hydrology of watersheds and would create minor to moderate long-term adverse impacts to water resources through increased surface water velocity and decreased infiltration. Long-term, repeated use of permanent roads also increases the probability for pollutant spills and introduction into water bodies. Overall short- and long-term adverse impacts to water resources from resource use activities are anticipated to be minor to moderate under this alternative and greater than under Alternative A.

Lands and Realty: Impacts would remain negligible as discussed under Impacts Common to All Alternatives. ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 189,153 acres are avoided from ROW development in Alternative B (Table 4-29).

Livestock Grazing: Grazing would be allowed on 272,000 acres. While most effects would be similar to Impacts Common to All Alternatives, there would be less risk to impact water quality than Alternative A due to the capability requirements on steeper slopes and erodible soils for new grazing allotments within the Exemption Area. This would limit authorized grazing within riparian areas on new allotments in the Exemption Area where livestock would tend to concentrate on the bottoms of drainages where riparian areas exist.

Minerals – Fluid: Table 4-30 lists acreages of closed, NSO and CSU stipulations for Alternative B. A smaller number of wells and associated infrastructure would likely be constructed as under Alternative A. Impacts to surface water would be moderate in the short term. Impacts would include increased sedimentation due to erosion of newly created roads and well locations, as well as higher total dissolved solids from newly exposed soft rock formations; although stipulations requiring reclamation plans on steep slopes and sensitive soils would decrease long-term impacts to minor, occasionally moderate.

Renewable Energy: As shown in Tables 4-23 and 4-24, approximately 768 acres of short-term and 192 acres of long-term surface disturbance are expected to result from renewable energy development activities under Alternative A. Impact to water resources would remain negligible as discussed in Impacts Common to All Alternatives. Renewable Energy ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 189,153 acres are avoided from renewable energy ROW development (Table 4-31).

Special Designations: The restrictions and other actions associated with the Fossil Cycad and Fort Meade ACECs would limit impacts to water resources in these areas.

Impacts under Alternative C

Areas subject to oil and gas lease stipulations designed specifically to protect water resources under Alternative C include NSO restrictions in and within 300 feet of riparian areas, floodplains, wetlands and waterbodies, slopes over 25 percent, sensitive soils, and areas within 1/4 mile of reservoirs with fisheries. ROW restrictions identified for soil or water resources under Alternative C include exclusion areas on slopes over 25 percent, sensitive soils, floodplains, and reservoirs with fisheries. See Tables 4-26, 4-27, and 4-28. The NSO restriction and exclusion areas for ROWs on sensitive soils and slopes 25-50 percent offer the most protection compared to the other alternatives. The exception is that Alternative C does not provide the NSO protection on very steep slopes (slopes over 50 percent) that Alternative D provides. The additional benefit is slight as BLM receives few requests to build projects on slopes over 50 percent.

Soil Resources: Under Alternative C, approximately 39,230 acres and 14,061 acres of BLM-administered would be covered by NSO lease stipulations in areas with sensitive soils and slopes greater than 25 percent, respectively. Modifying CSU stipulations to NSO, as under Alternative C, would provide a slightly greater level of protection against excessive erosion and sedimentation. Beneficial minor short- and long-term impacts would remain as discussed under Impacts Common to All Alternatives.

Fire Management and Ecology: The type and scale of effects of treatments (mechanical) and management activities (prescribed fire) to emphasize healthy forest conditions and to restore desired ecological conditions of rangelands would be the same as described in Alternative B. Excluding Greater Sage-Grouse PPAs from fire treatments is anticipated to reduce short-term adverse and long-term beneficial impacts to surface water resources compared to Alternative B. Since there would be no fire, in the short term vegetative cover would not be decreased, thus less protective effects and more mobilization of soil particles by rainfall events would not take place. With no fire, vegetation would not be stimulated to be more vigorous and varied, thus added protective vegetation would not be present in the longer term.

Wildlife and Special Status Species: Short- and long-term impacts to water would continue to provide minor benefits as discussed under Impacts Common to All Alternatives. Acres of wildlife resource restrictions are presented throughout the alternatives in Table 4-28.

Forest and Woodland Products: Forest and woodland product treatments would favor natural treatment processes to work toward desired conditions. Off-site removal of forest products with an economic value would be allowed where no permanent roads would be required. The Probable Sale Quantity for all forest and woodland products would be 6,000 tons per year. Forest and woodland product resource use would create the lowest magnitude of adverse short- and long-term impacts to water quality under Alternative C when compared to the other alternatives.

Lands and Realty: Impacts would remain negligible as discussed under Impacts Common to All Alternatives. ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 199,420 acres are excluded from ROW development in Alternative C (Table 4-29).

Livestock Grazing: Grazing would be allowed on 271,000 acres. While most effects would be similar to Impacts Common to All Alternatives, there would be less risk to impact water quality than Alternatives A, B, and D as new livestock grazing allotments would not be authorized within the Exemption Area. This would limit authorized grazing within riparian areas in the Exemption Area where livestock would tend to concentrate on the bottoms of drainages where riparian areas exist.

Minerals – Fluid: Considerably fewer wells and associated infrastructure would likely be constructed in Alternative C as under other alternatives due to significantly larger acres closed due to the Greater Sage-Grouse PPA and Black Hills Army Depot. Also, more restrictive CSU, NSO and other lease closure stipulations would apply than under the other alternatives (Table 4-30). Many wells could be drilled from other locations, but a few more marginal wells may conceivably become uneconomical to drill. As discussed in the Soil Resources section, additional NSO surface use restrictions for fluid mineral development in areas of sensitive soils would be unique to this alternative and would provide the greatest level of protection to water resources, due to less sediment and dissolved solids being mobilized by well and road construction in more fragile areas. Impacts to surface water would be minor, occasionally moderate in the short term. Long-term adverse impacts would be minor; less than under Alternatives A, B, and D.

Renewable Energy: As shown in Tables 4-23 and 4-24, approximately 588 acres of short-term and 78 acres of long-term surface disturbance are expected to result from renewable energy development activities under Alternative A. Impacts to water resources would remain negligible as discussed in Impacts Common to All Alternatives. Renewable Energy ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 199,420 acres are excluded from renewable energy ROW development (Table 4-31).

Special Designations: Compared to Alternatives B and D, a sage-grouse PPA ACEC designation in Alternative C would not provide increased levels of protection as protective measures are set forth under PPAs management actions under Alternative B and D and these measures would be implemented regardless of an ACEC designation for Greater Sage-Grouse PPAs (refer to the Summary of Restrictions Table 2-1).

Calling attention to a sage-grouse PPA through an ACEC designation may result in a slight increase in visitor use from people driving out to watch the strutting activity of sage-grouse during March and April when soils and drainage crossing on unimproved two-track roads are saturated and sensitive to damage. The impacts to soil and water resources from additional visitor use would be slight and limited to small areas.

Impacts under Alternative D (Preferred Alternative)

Areas subject to oil and gas lease stipulations designed specifically to protect water resources under Alternative C include NSO restrictions in or within 300 feet of riparian areas, floodplains, wetlands and waterbodies and areas within 1/4 mile of reservoirs with fisheries. Also included are CSU stipulations on slopes between 25 – 50 percent and sensitive soils. Overall, Alternative D provides more protection than Alternatives A and B, but offers less protection than Alternative C which includes more stringent protection measures for soils.

While proposals to occupy slopes over 50 percent are not common, Alternative D would provide more protection when compared to Alternatives A, B, and C which provide a CSU stipulation for slopes over 50 percent. In this respect, the additional protection would result in slightly less potential for erosion and sedimentation of streams and rivers compared to Alternatives A, B, and C.

Compared to Alternative C, Alternative D would provide less protection on slopes as Alternative C provides a more stringent NSO stipulation on all slopes over 25 percent. Erosion may be slightly higher than Alternative C but there would not likely be a major difference in sediment loads in streams and rivers because a CSU stipulation under Alternative D would not allow occupancy unless concerns about accelerated erosion are minimized by the project proponent.

ROW restrictions identified for soil or water resources under Alternative D include avoidance areas on slopes over 25 percent, sensitive soils, floodplains, and reservoirs with fisheries (Tables 4-26, 4-27, and 4-28).

Soil Resources: Under Alternative D, the same number of BLM-administered surface acres would be covered by CSU restrictions as in Alternative B (Table 4-26). Soil management activities would create similar beneficial minor short- and long-term impacts to water quality as in Alternative B.

Fire Management and Ecology: The types and scale of effects of treatments (mechanical) and management activities (prescribed fire) to emphasize healthy forest conditions and to restore desired ecological conditions of rangelands would be the same as described in Alternative B. Long-term beneficial impacts to water resources would also be the same as in Alternative B.

Wildlife and Special Status Species: Short- and long-term impacts to water would remain minor beneficial as discussed under Impacts Common to All Alternatives. Acres of wildlife resource restrictions are presented throughout the alternatives in Table 4-28.

Forest and Woodland Products: Management of forest and woodlands product usage would be the same as under Alternative B, except at the Fort Meade ACEC, where roads would be realigned to protect other resources. Overall adverse impacts to water would likely be greater than under Alternatives A and C, and slightly less than under Alternative B.

Lands and Realty: Impacts would remain negligible as discussed under Impacts Common to All Alternatives. ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 5,836 acres are excluded and 191,704 acres avoided from ROW development in Alternative D (Table 4-29).

Livestock Grazing: Grazing would be allowed on 272,000 acres. While most effects would be similar to Impacts Common to All Alternatives, there would be less risk to impact water quality than Alternative A due to the capability requirements on steeper slopes and erodible soils for new grazing allotments within the Exemption Area. This would limit authorized grazing within riparian areas on new allotments in the Exemption Area where livestock would tend to concentrate on the bottoms of drainages where riparian areas exist.

Minerals – Fluid: A similar number of wells and associated infrastructure would likely be constructed as under other alternatives. Under Alternative D, Closed, NSO and CSU lease stipulations would be similar to those implemented in Alternative B (Table 4-30). In addition, the Fossil Cycad ACEC would be closed to fluid mineral leasing and surface use.

Renewable Energy: As shown in Tables 4-23 and 4-24, approximately 520 acres of short-term and 130 acres of long-term surface disturbance are expected to result from renewable energy development activities under Alternative A. Impacts to water resources would remain negligible as discussed in Impacts Common to All Alternatives. Renewable energy ROW restrictions to other resource uses may provide added protection to water resources by providing an increase to vegetation buffer corridors. A total of 118,904 acres are excluded and 78,636 acres avoided from renewable energy ROW development (Table 4-31).

Special Designations: The restrictions and other actions associated with the Fossil Cycad and Fort Meade ACECs would limit impacts to water resources in these areas

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Authorized surface-disturbing activities are subject to an onsite evaluation of potential water resource disturbances to avoid, mitigate, and minimize water quality degradation.

Past and present actions that have affected and would continue to affect water resources include mineral exploration and development; improper livestock grazing (i.e. livestock grazing not in accordance with the Dakotas Guidelines for Livestock Grazing Management); recreation; vehicle travel; and fire. In general, these actions have adverse short- and long-term cumulative impacts on water resources through pollution introduction and surface disturbance that contributes to resource contamination, soil compaction, erosion, and subsequent sedimentation. Fluid mineral exploration and development also has the potential to introduce contamination to ground and surface water via hydrologic fracturing, produced water spills, groundwater flow through leaking reserve pits and mobilization of harmful substances, and introduction of drilling fluids to aquifers.

Over the life of the plan 1,400 acres of upland and 4 miles of riparian areas are anticipated to improve through the implementation of the Standards for Rangeland Health. This would increase ground cover and reduce runoff, thereby reducing erosion and subsequent sediment production.

The areas considered in the analysis in this section are the nine counties with substantial amounts of BLM surface and mineral estate (Harding, Butte, Lawrence, Pennington, Custer, Fall River, Meade, Perkins, and Stanley counties). Wheat, flax, hay, and sunflowers are the major crops produced on private land in this area. Of the 12.7 million acres in these counties, about 50 percent is rangeland.

Compared to other areas, the Northern Great Plains is experiencing a high conversion rate of grasslands to croplands (USDA, Economic Research Service, 2007). Between 1997 and 2007, USDA estimated that 1.1 percent of rangeland was lost due to cropland conversion in a 77 county study area that was completed for portions of North and South Dakota and western Nebraska (USDA Economic Research Service, 2011). Major factors that influenced this trend include changes in

market incentive loans, changes in farm programs such as CRP and changes in crop disaster insurance. Other major factors include market factors, interest rates, production costs and increased yield as a result of improved technology.

Based on information in the 2011 USDA report and a review of Natural Agriculture Statistics data, Resources Inventory on planted acres, BLM estimates that a maximum of 66,000 acres of rangeland on privately owned surface are likely to be converted to cropland in the nine counties listed above over the next ten years. If trends continue in this manner, a maximum of 132,000 acres of rangeland may be converted to cropland over the next 20 years. The majority of this conversion would result in surface disturbance, although certain farm practices such as no-till farming and other conservation practices would reduce the degree of disturbance. The acres provided are the maximum number of acres that are expected to be converted from grassland to cropland; actual acres may be lower in certain counties such as western Butte County where soils have lower potential for farming. In addition, areas with marginal soils that receive less than 16 inches of annual precipitation may receive lower levels of conversion of rangeland to croplands. In the nine-county area, BLM estimates that wind energy development would result in up to 3,500 acres of short-term disturbance and 900 acres of long-term disturbance on lands that are not administered by the BLM (other federal lands, private, state, tribal lands, etc.). The maximum levels of wind energy development on BLM-administered surface estate are expected to result in 924 acres of short-term disturbance and 231 acres of long-term disturbance.

The BLM estimates that the conversion of all lands in these counties for other uses such as transportation, infrastructure, and building would occur at a much lesser rate than conversion of rangeland to farm land; however, specific figures are not available. On a nationwide basis, USDA has determined that urban land acreage increased at about twice the rate of population growth in the years 1945 to 2007 (USDA 2007). Urban growth in the nine-county analysis area described in this section is expected to be slow as many of the counties are experiencing slow, static or declining population changes. For example, the population of Harding County in northwest SD declined by seven percent and the population of the county seat (Buffalo, SD) declined by 13 percent from 2000 to 2010. The exception to this trend is the northern Black Hills and areas along the nearby Interstate 90 corridor where subdivision, infrastructure development, and population growth is much higher than in other portions of the nine-county cumulative analysis area. For more information about the population growth by area, refer to the Population portion of the Social section of Chapter 3.

Oil and gas development could result in a maximum of 2,380 acres of short-term disturbance (449 wells) and 1,437 acres of long-term disturbance on other (non-BLM-administered) lands in the nine-county area.

Oil and gas development on BLM-administered federal minerals (including BLM surface estate) is expected to result in a maximum of 138 to 301 acres of long-term surface disturbance (43-94 wells). Development of other BLM-administered minerals is expected to result in a maximum of 400 acres of short-term disturbance and 100 acres of long-term disturbance in the nine-county area. Bentonite mining would account for most of the acres disturbed.

Table 4-32 was developed using a combination of sources including the USDA reports cited above (USDA 2007, 2011, 2012), conversations with the mining industry (2010-2012), SD DENR (2012), and the SD RMP development scenarios including the Oil and Gas RFD. This table represents the maximum number of acres impacted under any alternative.

The amount of disturbance on BLM-administered surface estate only would range from 325 to 376 acres (0.00003 percent of the nine counties) of short-term disturbance and 1,950 to 2,290 acres (0.0002 percent of the nine counties) of long-term disturbance under the various alternatives (long-term disturbance is the amount of short-term disturbance that is not reclaimed). The expected levels of surface disturbance from all sources on BLM-administered surface estate are shown in Table 4-23 and also described in the development scenarios at the beginning of this chapter. Under any of the management alternatives, the level of adverse cumulative impacts to soil and water would be negligible because 1) disturbance on BLM surface and mineral estate would be very small in relation to the landscape affected; 2) the disturbance would occur in different watersheds over a 20 year period; and 3) 80-85 percent of the disturbance would be reclaimed.

Actions that result in short-term surface disturbance on both BLM surface and mineral estate (split estate) would range from 4,637 to 5,067 acres of short-term disturbance and 811 to 887 acres of long-term disturbance under the various alternatives. In terms of short-term disturbance, this amounts to a 0.0004 percent of the 12.7 million acres in the nine-county analysis area. In terms of long-term disturbance, this amounts to 0.00007 percent of the 12.7 million acres in the nine-county analysis area.

An RFD scenario that would affect water resources would be the Dewey Conveyor ROW. Construction of the proposed conveyor and access road would permanently disturb approximately 16 acres of soil (2.7 acres of the 274,000 BLM acres in South Dakota) in the planning area (USDI, BLM 2009c). The access road would be constructed in compliance with BLM standards, but would still be expected to have minor adverse effects on water infiltration rates, soil erosion, and sedimentation.

Additional RFD impacts to water resources could occur from development of the proposed Dewey-Burdock in-situ uranium mining project. Surface water quality could be impacted by increased sedimentation during construction of the well field, access roads, and processing facilities. Complete reclamation of the well field and access roads would occur after mining operations have ceased. Surface water impacts, as determined in the Dewey-Burdock Plan of Operations (Powertech 2009), are anticipated to be minor to moderate. No direct disturbance to wetlands or surface water would occur. Any water disposed of through land application methods would be treated in compliance with state and federal concentration levels for specified constituents.

Groundwater within the ore zone would be impacted by an increase in naturally occurring dissolved constituents. Groundwater quality of the ore zone is currently very poor due to the presence of naturally occurring radionuclides, heavy metals, and other constituents that exceed EPA and/or state drinking water limits and can never be utilized for drinking or agricultural uses (Powertech 2009). Proper casing and monitoring of production wells would be crucial to avoid the release of soluble uranium and other constituents into aquifer zones above the ore zone.

Waste fluids from the in-situ mining process would be disposed of via well injection into a confined aquifer below the ore zone. Aquifer water quality in the deep confined aquifer is often poor and does not meet drinking water standards. Demonstrating that this aquifer is hydrologically isolated from overlying aquifers is an EPA requirement and requires South Dakota Underground Injection Control (UIC) permitting. Injection would not occur unless site-specific and regional aquifer characteristics limit the potential for drinking water contamination, thereby creating small potential environmental impacts as defined by the United States Nuclear Regulatory Commission (NUREG 1910).

Groundwater consumption during aquifer restoration would have minor to moderate adverse effects on groundwater availability in the Inyan Kara aquifer due to drawdown. Water wells being restored closest to the well field would most likely be affected. Water levels for the closest domestic well completed in the Fall River Aquifer could drop by approximately 10 to 43 feet. Water levels for the closest domestic well completed in the Lakota Aquifer could drop by approximately 5 to 13 feet (Powertech 2009).

A series of monitoring wells would be installed around the mining operation's perimeter to help detect unanticipated water level changes and contaminated leach fluid excursions outside the well field. Monitor wells are routinely sampled to detect any excursions. If an excursion is verified, production well extraction/injection rates would be adjusted to create a hydraulic gradient back toward the production zone. As with fluid mineral development, borehole pressures below casing and formation rupture pressures must be maintained to prevent well casing failure and excursions.

Implementation of Environmental Protection and Monitoring, Interim Management, and Reclamation, Restoration and Facility Decommissioning Plans are anticipated to minimize impacts to surface and groundwater quality to minor levels. Impacts to groundwater availability could be moderate due to aquifer drawdown.

Future bentonite development within the planning area is also anticipated. Prior to approval of the Shear-Clarkson mine, 7,447 acres of bentonite deposits were under permit in the planning area. Of this total, 1,101 acres are BLM lands (of 274,000 acres of BLM land) and 6,346 are privately owned. About 63 acres of BLM land have been disturbed by mining and have not been reclaimed. Table 4-33 summarizes the past, present, and reasonably foreseeable bentonite mining permit acreages in the planning area. Under normal circumstances, 30 percent of a permitted parcel would actually be mined. Lands outside mined areas may receive some disturbance from haul roads, equipment movement, and other associated activities.

Initiating reclamation (including recontouring, topsoil replacement, reseeding) immediately following completion of bentonite mining operations would mitigate cumulative impacts. It is anticipated that no more than 100 acres of mined areas would be disturbed at any one time. Cumulative impacts of bentonite mining to water resources are anticipated to be the same under all alternatives.

Ongoing agricultural activities on private lands (livestock grazing and farming) would continue at existing rates. While water quality should improve as TMDLs are developed and implemented, the exact locations and magnitude of the improvements are impossible to determine at this point.

Cumulative Impacts under Alternative A (Current Management)

Under Alternative A, it is anticipated that up to 1,966 acres (less than 1 percent of the 274,000 decision area) of short-term surface disturbances could occur on BLM-administered surface over the next 20 years. The majority of impacts would result from renewable energy development. Surface disturbances would not occur all at one time and would likely be spread through several watersheds. Therefore, these figures represent the worst-case scenario. Interim reclamation would reduce impacts to approximately 376 acres of long-term soil disturbance (Tables 4-23 and 4-24).

Alternative A would provide the least amount of protection for water resources on BLM-administered surface, and would result in the greatest level of cumulative impacts when compared to the other alternatives. Cumulative adverse impacts to surface water and groundwater (shallow and deep) are anticipated to be minor to moderate at local scales and minor across the planning area.

Continuing existing management, along with the continuance of existing private activities, should maintain current water quality and trends. Minor improvements could be experienced as TMDLs are implemented.

Cumulative Impacts under Alternative B

Under Alternative B, it is anticipated that up to 2,174 acres of short-term surface disturbances could occur on BLM-administered surface over the next 20 years. The majority of impacts would result from mechanical forest treatments, renewable energy development, and prescribed fire activities. Surface disturbances would not occur all at one time and would likely be spread through several watersheds. Therefore, these figures represent the worst-case scenario. Interim reclamation would reduce impacts to approximately 325 acres of long-term surface disturbances (Tables 4-23 and 4-24).

Alternative B would provide an intermediate level of protection for water resources on BLM-administered surface when compared to the other alternatives. Cumulative adverse impacts to surface water and groundwater (shallow and deep) are anticipated to be fewer than under Alternative A due to a decrease in projected long-term surface disturbance from 376 acres to 325 acres. Cumulative adverse impacts to water would be minor to moderate at local scales and minor across the planning area.

Since expected levels of disturbance would represent a reduction from the levels possible under current management, water quality could be slightly improved from Alternative A. However, this would likely be difficult to detect. Therefore, the relatively minor level of disturbances resulting from authorized impacts along with private activities should maintain water quality and all existing trends. Minor improvements could be experienced as TMDLs are implemented.

Cumulative Impacts under Alternative C

Under Alternative C, it is anticipated that up to 1,651 acres of short-term surface disturbance could occur on BLM-administered surface over the next 20 years. The majority of impacts would result from mechanical forest treatments, renewable energy development, and prescribed fire activities. Surface disturbances would not occur all at one time and would likely be spread through several watersheds. Therefore, these figures represent the worst-case scenario. Interim reclamation would reduce impacts to approximately 237 acres of long-term surface disturbance (Tables 4-23 and 4-24).

Alternative C would provide the most extensive protections for water resources when compared to the other alternatives. Cumulative short- and long-term adverse impacts to surface water and groundwater (shallow and deep) are anticipated to be less than under the other alternatives. Cumulative adverse impacts to water would be minor to moderate at local scales and minor across the planning area.

Since expected levels of disturbance would represent a reduction from the levels possible under current management, water quality could be slightly improved from Alternative A; however, this would likely be difficult to detect. Therefore, the

relatively minor level of disturbances resulting from authorized impacts along with private activities should maintain water quality and all existing trends. Minor improvements could be experienced as TMDLs are implemented.

While BLM-administered lands would be protected the most under Alternative C, some trade-offs from the high degree of restriction provided may occur. In some cases, the ACEC designation of Greater Sage-Grouse PPAs combined with closure/withdrawal of minerals and ROW exclusion in PPAs may concentrate or shift activities and use to private lands in the PPA to private and public lands in areas adjacent to the PPA. Since the BLM does not control the management on all lands in or near the proposed PPA, the shifting or concentration of use could result in more intense use and infrastructure in specific areas. Without the closure/withdrawals and ACEC designation, this disturbance would occur over a larger area that could be better absorbed by the system. In addition, when proposed activities are moved to non-BLM-administered lands, the BLM loses control over project design features, hazardous materials management and mitigation of site-specific impacts, and would not be able to require disturbed areas to be reclaimed.

While the NSO stipulation provided in Alternative B and D would also tend to shift some future oil and gas activities and infrastructure onto private or non-federal lands adjacent to the PPAs or to private or non-federal lands within the PPAs, the impact would be less than Alternative C as an ACEC designation and a non-renewable energy ROW exclusion would not be proposed in combination with an NSO stipulation under Alternatives B and D.

Cumulative Impacts under Alternative D (Preferred Alternative)

The RFDs would be the same as described under Impacts Common to All Alternatives and would create similar impacts due to surface disturbances.

Under Alternative D, an anticipated 2,290 acres of short-term surface disturbance could occur on BLM-administered lands over the next 20 years. The majority of impacts would result from mechanical forest treatments, renewable energy development, and prescribed fire activities. Surface disturbances would not occur all at one time and would likely be spread through several watersheds. Therefore, these figures represent the worst-case scenario. Interim reclamation would reduce impacts to approximately 354 acres of long-term surface disturbances (Tables 4-23 and 4-24).

Alternative D would provide an intermediate level of protection for water resources when compared to the other alternatives. Cumulative adverse impacts to surface water and groundwater (shallow and deep) are anticipated to be less than under Alternatives A, but greater than under Alternatives B and C. Cumulative adverse impacts to water would be minor to moderate at local scales and minor across the planning area.

Since expected levels of disturbance would represent a reduction from the levels possible under current management, water quality could be slightly improved from Alternative A; however, this would likely be difficult to detect. Therefore, the relatively minor level of disturbances resulting from authorized impacts along with private activities should maintain water quality and all existing trends. Minor improvements could be experienced as TMDLs are implemented.

Vegetative Communities – Rangeland, Riparian and Wetlands, Forests and Woodlands

Actions that contribute to the decline in abundance or distribution of naturally occurring grassland and shrubland communities are considered adverse impacts. Conversely, beneficial impacts to these communities include actions that protect or restore them in the planning area.

Direct impacts to grassland and shrubland communities result from surface-disturbing and other activities that result in vegetation removal and mechanical damage to plants. Impacts of surface disturbance on vegetation include soil compaction, erosion, changes in hydrology, and encroachment by invasive species. Surface-disturbing activities generally are considered an adverse direct impact to grassland and shrubland communities. Activities such as livestock grazing, wildlife use, wildfire and vegetative treatments (e.g., prescribed fire, chemical, or biological) also have direct impacts on these communities, which may be both adverse and beneficial.

Indirect impacts to grassland and shrubland communities result from activities that alter the quality and health of these communities. For example, activities that result in soil compaction, erosion, changes in hydrology and encroachment of invasive plant species are considered indirect impacts. Beneficial impacts to grassland and shrubland communities include activities that minimize, reduce, or prevent the spread of invasive plant species into these communities and vegetative treatments to improve these communities.

Direct effects to riparian and wetland communities result from disturbing vegetation or ground surface within these communities. Indirect effects to riparian and wetland communities result from actions within a watershed that cause a change in riparian and wetland functionality (e.g., increased rates of sediment loading or changes in hydrology).

Short-term effects to vegetation result during initial surface disturbance prior to stabilization by vegetation or practices/structures that minimize water and wind erosion. Long-term effects change ecological status from late seral or potential natural community (PNC) to low or mid seral plant communities for more than five years.

Potential Natural Community (PNC) is the biotic community that would become established on an ecological site if all successional sequences were completed without interference by man under the present environmental conditions. Natural disturbances are inherent in its development.

Ecological status refers to the present state of vegetation and soil protection of an ecological site in relation to the potential natural community for the site. Vegetation status is the expression of the relative degree of which the kinds, proportions, and amounts of plants in a community resemble that of the potential natural community. The four classes of ecological status ratings are early seral, mid-seral, late-seral, and potential natural community with vegetation corresponding to 0 to 25 percent, 26 to 50 percent, 51 to 75 percent, and 76 to 100 percent of the potential natural community standard.

Guidelines and Assumptions

Treatments such as prescribed fire and mechanical treatments are used to meet resource objectives and fuels reduction objectives. Prescribed fires are those set intentionally and managed for ecological benefit. Prescribed fire and fuels management are generally beneficial to rangeland vegetation. A healthy forest is more stable and much more resilient to natural and widespread wildfires.

Livestock grazing would have no long-term impact if properly managed under the Standards for Rangeland Health and Guidelines for Livestock Grazing Management (Appendix A).

Livestock grazing causes minimal small-scale surface disturbance when properly managed.

All riparian areas are evaluated according to the Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997a) and managed for PFC. Streams and wetlands that are in PFC are able to process high runoff events more effectively than those that are not functioning properly. The more surface disturbance in a watershed, the greater the probability that excess surface runoff and sediment would enter the stream or wetland and contribute to the loss of riparian and wetland functionality.

The need to manage forests would increase to accommodate other multiple uses, such as emphasis on restoring stand diversity for wildlife habitat and increased recreation use. Forest health (including restoration and hazardous fuels reduction) objectives would be the major determining factor in forest management activities.

Impacts Common to All Alternatives

Under all alternatives, meeting Standards for Rangeland Health would ensure healthy sustainable rangelands, including riparian and wetland areas. Riparian and wetland areas are functioning properly when adequate vegetation and woody debris is present to dissipate stream energy associated with high-flow events, subsequently reducing erosion and improving water quality. Meeting all five standards would ensure riparian and wetland vegetation is in balance with upland vegetation and assist in erosion control, bank stabilization, and sediment filtration. Timing, intensity, frequency, and duration of livestock grazing, in addition to livestock behaviors and foraging preferences, can alter effects to riparian and wetland area vegetative component; adjusting livestock grazing use would promote sufficient vegetation within riparian and wetland areas.

Vegetation treatments, while resulting in short-term disturbance, would result in long-term beneficial impacts to grassland, shrubland, and forest communities. Vegetation treatments can successfully achieve vegetative objectives to increase plant and seral stage diversity, control invasive species, improve the quality and quantity of vegetation for wildlife and livestock, and create or maintain the desired mosaic for wildlife habitat and visual quality.

Current practices regarding surface-disturbing activities are analyzed at the project level and mitigation measures are applied as needed. These mitigation measures would support reclamation success.

Climate: Air quality impacts to vegetation are expected to be negligible. Small quantities of ozone may be formed in the atmosphere due to reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOCs) emitted from equipment operated in the planning area. In relatively high concentrations, ozone can adversely affect vegetation by damaging foliage. However, ozone concentrations within the planning area are well below ozone secondary National Ambient Air Quality Standards (NAAQS) that were set by EPA to protect vegetation. Due to the relatively low quantities of NO_x and VOC emissions associated with planning area activities, negligible increases in ozone concentrations would be expected to occur.

Potential changes in climate that would affect temperature and precipitation would affect plant communities. Changes to seasonal weather patterns, ambient air temperatures, carbon levels, and the timing and amount of precipitation could result in direct, long-term impacts to many native plant communities. Since the specific type or degree of changes to climatic conditions is not fully understood at this time, determining impacts to individual plant communities over the next 20 years is difficult. An increase in the vulnerability to pests, invasive species and a loss of native species is likely to occur through a combination of climate change and human-induced stresses (Karl, et al. 2009). Adaptation to changing conditions through adaptive management practices would provide the best means to reduce adverse impacts to vegetative communities.

Recent research in the northern Great Plains indicates net reductions of greenhouse gas (GHG) emissions on native range pastures can be most effectively achieved through moderate stocking rates (Liebeg, et al. 2010). This research underscored the value of moderately grazed native rangeland in the northern Great Plains to serve as a net CO2 sink, especially in comparison to heavily grazed pastures.

Fire Management and Ecology: A maximum of about 1,400 acres would be treated each year through mechanical treatments and prescribed fire. This is roughly 1/2 of one percent of the planning area. Providing fire and mechanical treatments to the small number of acres would have minor short-term impacts to vegetation and negligible long-term impacts to vegetation.

Alternative A would have an average of approximately 346 acres of mechanical treatment and 213 acres of prescribed fire each year. Alternatives B and D would have an average of approximately 400 acres mechanically treated and 1,000 acres of prescribed fire each year. Alternative C would have approximately 350 acres mechanically treated and 500 acres of prescribed fire each year. Most mechanical treatments in forested areas would occur in the Fort Meade ACEC and Exemption Area, but for fire and fuels analysis, mechanical treatments include acres across the entire planning area.

Wildfire and prescribed fire have impacts on grassland, shrubland and forest communities. In the short term, fire can 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, impacts resulting from fire usually are long-term and depend on the scale and severity of the disturbance. The potential for sagebrush shrublands to re-establish depends on the acreage burned, severity of the burn, the distance to seed sources, the climate class (i.e. amount of moisture the sagebrush receives), the type of sagebrush, and the spread of invasive species. Invasive species such as cheatgrass increase fire frequency, preventing shrub re-establishment.

Prescribed fire often has a minimal impact on western wheatgrass production with short recovery, while some bunch grasses such as green needlegrass may take longer to recover. Short deferment of livestock grazing on mixed grass prairies can generally take place following prescribed fire without decreasing production of desirable plant species (White and Currie 1983). Livestock grazing can normally resume by late June, although a lower stocking rate is sometimes recommended (White and Currie 1983).

Limiting fire in some cases would lessen direct loss of grassland and shrubland communities and reduce the potential 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. Fire suppression activities can limit short- and long-term fire damage to vegetation, but would cause mechanical damage to vegetation and increase the likelihood of invasive species introduction or spread. Short- and long-term impacts to grassland, shrubland and forest communities would occur from both wildland fire and suppression tactics. Using full suppression tactics would damage vegetation and potentially spread invasive species. If invasive species are already present, potential for spread would increase regardless of the type of suppression used.

Use of heavy equipment for fire suppression would be restricted in riparian areas and streamside zones. Riparian vegetation would be protected from surface disturbance caused by fire suppression activities. Wildfires could potentially become severe where fire could not be suppressed due to the restrictions on use of heavy equipment. These sites would likely cause damage to larger acreages of vegetation with both short- and long-term impacts to vegetative communities. A greater impact to riparian vegetation would occur from Alternative A than Alternatives B, C, and D, where use of heavy equipment would not be restricted but would be carried out through consultation with Resource Advisors. Resource Advisors coordinate with various resource specialists as wildfire and prescribed fire activities are planned and conducted. Potential impacts and recommendations to reduce resource impacts are passed on to the firefighters.

Fluid Minerals: Mineral development on BLM land can result in the direct removal of vegetation. Rangeland health and forage production can be indirectly affected by mineral development through the introduction and spread of invasive plant species and soil loss. Both the direct and indirect impacts of mineral development are associated with surface disturbance caused by constructing road networks; drilling; installing well pads, pumps, pipelines, and water detention facilities; other associated infrastructure; and ongoing maintenance.

When compared to other minerals, oil and gas development and bentonite production are anticipated to cause the most surface disturbance and hence, the most adverse impact on vegetative communities in the planning area. Both short- and long-term impacts to vegetative communities occur. The degree of impact would depend on the rate of development, production success, and how quickly disturbed areas are reclaimed. For example, it is expected that disturbed areas associated with nonproducing wells would be reclaimed fairly quickly. This would be considered a short-term adverse impact. On the other hand, for producing wells, it may take many years before disturbed areas are reclaimed and reseeded back to native perennial vegetation. This would be a long-term adverse impact. Reduction in perennial vegetation and creation of sites for the spread of invasive species would be local since development is unlikely to occur simultaneously across the entire area (e.g., all wells developed at the same time). The short- and long-term impacts to upland vegetative communities from oil and gas development is expected to be minor to negligible across all alternatives.

Riparian and wetland areas would be protected from oil and gas activity through NSO lease stipulations designed specifically to protect water resources under all alternatives. Alternative specific stipulations would mitigate impacts to riparian areas which would result in negligible impacts to riparian and wetland vegetation.

Invasive Species, Including Noxious Weeds: The use of certified weed seed free forage limits the potential for introduction and spread of noxious weeds. The requirement to use certified weed seed free forage on BLM lands would subsequently have a beneficial impact for vegetative communities by protecting vegetation components and diversity.

Livestock Grazing: Livestock grazing would impact health and productivity of vegetative communities. Livestock congregation areas would be the most likely to negatively affect rangeland health on small proportions of allotments. These include areas containing water, shade, or more palatable forage. Therefore, management is often geared toward improving the overall distribution of livestock within an allotment. This is accomplished through implementation of Guidelines for Livestock Grazing Management through activities such as developing allotment management plans, changing grazing systems, and implementing range improvement projects (i.e., fencing, water development projects, salt and mineral licks).

Achieving or maintaining the Standards for Rangeland Health and following the Guidelines for Livestock Grazing Management are generally effective in managing potential adverse effects to vegetation from livestock grazing. Adjustments to grazing authorizations are made on a case-by-case basis when site-specific studies indicate changes in management are needed. However, according to BLM rangeland health assessments completed since 2004, approximately 4,500 acres of the 260,000 acres assessed within the planning area did not meet Standards for Rangeland Health as a result of livestock grazing (BLM 2010b). Corrective management actions have been implemented on all grazing allotments that

did not meet the Standards. Reassessment of some of the allotments not meeting Standards indicates that 3,100 acres have improved and now meet the Standards, leaving 1,400 acres still not meeting Standards due to livestock grazing.

In 2007, the SDFO completed an extensive survey of riparian areas with some additional surveys completed through 2010. Riparian areas were assessed using the PFC methodology. The PFC assessments are used by the BLM and many other federal agencies to assess the condition and capabilities of riparian systems. The assessments are also used to flag areas that require more in-depth quantitative monitoring. PFC assessments were completed on 54 miles of major riparian areas on BLM-administered land within the decision area. Of the areas assessed, the study indicated that 68 percent (or 37 miles) of riparian areas on BLM-administered lands in South Dakota are in PFC. Thirty percent, or 16 miles, are Functioning at Risk (FAR) and 2 percent (one mile) are Non-Functioning (NF).

Managing livestock grazing to meet the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management would provide an improving trend on the 4 miles of stream in FAR with grazing management issues and the 1,400 acres not meeting Standards due to livestock grazing. This would suggest that banks are healing and riparian vegetation is becoming established thereby improving riparian vegetation.

Range improvement projects would cause eight acres of annual surface disturbance pre-reclamation. These acres would be reduced to 0.3 acres post-reclamation. Mitigation measures for resource protection would be developed for each project under all alternatives. Range improvement projects within or near riparian and wetland areas would be subject to stringent mitigation measures. All reclamation should be completed in the short term. Impacts to vegetative communities from range improvements are therefore negligible to upland, riparian, and wetland vegetation among the alternatives.

Expansion of invasive species can also affect rangeland health. Livestock transport of invasive species seed could increase spread of these species.

Placement of livestock supplements at least 1/4 mile away from riparian areas would improve riparian vegetation through more uniform grazing distribution. Protecting vegetative buffers from concentrated livestock use would decrease stream bank erosion and sedimentation. This would improve riparian/wetland areas not rated at PFC.

Only allowing grazing in areas of high concentrations of threatened and endangered species plants when the impacts are determined to be beneficial or negligible, as determined through a review by an interdisciplinary team, would ensure sustainability of threatened and endangered plant species. Impacts to riparian vegetation and threatened and endangered plants from these management actions would be beneficial in the short and long term.

Through proper grazing management, livestock grazing would improve rangeland health by improving plant vigor, removing old growth and decadent vegetation that inhibit new growth, increasing vegetative cover, reducing noxious weed infestations, and decreasing soil erosion. Healthier plant communities are more resistant to the spread of noxious weeds and other undesirable plant species. Targeted grazing in areas with invasive species at crucial points in the species' lifecycle would decrease the spread of invasive species by decreasing seed production or limiting vegetative propagation. Treatments that approximate natural disturbance regimes would sustain complexity, diversity, resiliency, and productivity in all plant communities.

Overall livestock grazing would have a net minor beneficial short- and long-term impact to vegetation through continued implementation of the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management for all alternatives. Assessed upland health sites and riparian areas would be expected to continue making significant progress toward meeting the Standards. Managing for the Montana/Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997a) would maintain the functionality of all riparian areas and wetlands.

Recreation: Recreation activities would result in localized effects, such as vegetation disturbance, trampling, and removal due to camping and off-road travel activities. Dispersed camp sites and developed recreation sites are often located in riparian areas. Casual recreation use would result in short-term localized impacts to vegetation as recreation sites would generally move from location to location. Very few developed recreation sites are within the decision area, therefore limiting long-term vegetation impacts to less than five acres out of the 274,000 acre decision area. Any effects to upland, riparian, and wetland vegetation would be negligible and mostly temporary due to the small number of recreation sites on BLM-administered surface land. Riparian areas may see more trampling from dispersed camping and hunting; however,

the timing of these activities after the growing season would have negligible effects to the vegetation. Any effects to vegetation would be negligible and short-term.

Soil Resources: The total number of acres of surface disturbance would vary slightly between alternatives as shown in Tables 4-23 and 4-24. Short-term surface disturbance would be reclaimed fairly quickly resulting in very low acreages of long-term surface disturbance (maximum of 376 acres). This amounts to less than one-fifth of 1 percent of the 274,000 acres in the decision area.

Surface use stipulations designed to protect soil resources would also minimize negative impacts to vegetation. Discussion of individual strategies for management of soil resources is provided in the Soil Resources section. Achieving or maintaining Standards for Rangeland Health and expertly evaluating the effects of proposed actions on soil resources would have a beneficial net effect on vegetation. Maintaining and promoting adequate ground cover, plant vigor, and nutrient cycling, along with biological, riparian, and wetland functions would help maintain a variety of habitat with a diverse assemblage of native plant communities indicative of the Northern Great Plains.

Projects to promote healthy and stable soils would have positive impacts on vegetation by reducing potential soil erosion. This includes the reclamation of previously disturbed lands. Reduced erosion could lead to a reduction in sites available for noxious weed establishment which would help maintain a diverse assemblage of native plant communities. This would be anticipated to have beneficial minor short- and long-term impacts under all alternatives. Impacts between alternatives do not vary considerably due to the small acreage of potential surface disturbance (alternatives vary between 253 and 376 acres long term) that would occur and surface use stipulations apply to all alternatives to protect soil resources.

Solid Minerals: Development of locatable and salable minerals is expected to continue at the same rate as in the past. Mineral exploration and development activities would remove vegetation in potential bentonite development areas. The amount of land that is not reclaimed to seeding stage would be a maximum of 100 acres at any given time. All mine sites would be contemporaneously reclaimed and seeded with native species as mining takes place. Disturbed sites would be reclaimed through the seeding stage within two to five years. Reclaimed mine sites would have adequate perennial vegetation to stabilize the site within two growing seasons. It would take five to ten years for herbaceous vegetation to reach equilibrium with surrounding vegetation. Sagebrush would take 20 to 30 years to re-establish to a level that is similar to pre-disturbance conditions. Alternative specific stipulations would mitigate potential impacts to riparian areas and wetlands.

Travel Management: OHV use on public lands can result in short- and long-term impacts to vegetative communities. A one-time disturbance resulting from OHV use causes physical damage to vegetation by breaking stems and branches and may disturb the soil surface depending on soil conditions, slope, and ground cover. Usually, with a one-time disturbance, plants and disturbed areas recover. However, with repeated use, new trails are established resulting in long-term loss of vegetation, soil erosion, and introduction of invasive species.

Areas where damage from OHV use is most likely to occur include stream crossings, areas with highly erosive soils, steep slopes, and vegetative communities with plants, such as Wyoming big sagebrush, susceptible to physical damage. Travel management and OHV use would affect vegetation through surface-disturbing activities. Transportation resources would affect vegetation through the building or rerouting new roads, primitive roads, and trails.

Vegetative Communities: Gathering plants and plant parts for incidental use would have a negligible adverse impact on vegetative communities. Incidental use, as defined in the Glossary, indicates that small quantities of plants would be gathered for personal use.

Vegetation treatments would cause short-term disturbance and would result in long-term impacts to grassland and shrubland communities. Vegetation treatments that successfully achieve 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. Vegetation treatments designed to decrease the presence of or reduce the susceptibility to invasion by invasive plants and pests and noxious weeds would have a beneficial impact on vegetation.

The use of native plant species would be the preferred method used to revegetate or reclaim areas. Non-invasive introduced species that pose little threat of displacing adjacent native vegetative communities could be used for reclamation and to restore vegetation in sites where resource protection (soils, wildlife habitat) would best be met by the use of non-native

introduced species. The high cost of native plant species is often a limiting factor to using native species on large scale revegetation efforts (Thompson, et al. 2006).

Using native species or non-invasive seed mixes to protect wildlife habitat and watershed resources on burned areas and sites with high erosion potential would minimize proliferation of noxious weeds (Booth and Vogel 2006). Perennial non-native species may initiate persistent stands, which can inhibit colonization by native herbaceous species (Foster, et al. 2007).

Managing prairie streams to ensure quality habitat for aquatic and wildlife species would maintain or improve riparian and wetland areas toward PFC. Where a site's capability is less than PFC, the BLM would strive to improve the condition of the wetland or riparian area. Implementing Guidelines for Livestock Grazing Management and utilizing riparian and wetland buffers would provide the best potential for meeting PFC or capability.

Wildlife and Special Status Species: BLM-authorized activities would actively manage for multiple ecosystems and a variety of habitat conditions with a diverse assemblage of native plant communities indicative of the Northern Great Plains for wildlife across the planning area. Special management needs for development of management plans and conservation measures would be identified consistent with restoration of wildlife habitat. Areas such as riparian/ wetland areas, cottonwood galleries, native grasslands, sagebrush steppe, woody draws and seasonal ranges supporting life cycle requirements for wildlife would be considered important habitats for restoration.

Maintaining 8 to 12 inches of residual herbaceous growth on 50 percent of the uplands at the Fort Meade ACEC for ground nesting birds would have a minor beneficial impact on vegetative communities. The moderate amount of residual herbaceous growth would be beneficial to plant vigor and reproduction. Litter accumulation could become an issue where the patchiness of the residual vegetation is not shifted from year to year.

Lands and Realty: Burial of all fiber optic, telephone and power lines would be highly encouraged within Alternatives B, C, and D. All other utility lines would be evaluated at the project level. Burial of utility lines would increase the amount of surface disturbance for utility lines compared to above ground lines. Increased surface disturbance would result in long-term loss of vegetation, soil erosion, and introduction of invasive species. Adverse impacts to vegetative resources would be negligible across the planning area.

Special Designations: In general, the impacts of special designations would have a beneficial impact to vegetation; however, there are exceptions as described under Alternative C of this section.

Impacts under Alternative A (Current Management)

Climate, Fluid Minerals, Invasive Species Including Noxious Weeds, Recreation, and Solid Minerals: Impacts would be the same as described in Impacts Common to All Alternatives.

Allowing surface-disturbing activities would affect the relative abundance, distribution, and occurrence of seral stages. It would not result in the complete elimination of a plant species, plant community, or seral stage, but it would allow an opening for noxious weed infestations. Additional localized disturbance in NF or FAR downward trend riparian and wetland areas could occur so long as the net impact is expected to be positive (more healing than new disturbance).

Under Alternative A, BLM-administered surface lands would have 6,894 and 15,489 acres Closed and with NSO lease stipulations, respectively (Table 4-30). There would also be 5,522 acres of ROW exclusion areas (Table 4-31). These acres include all stipulations and consider the overlap of various stipulations as described in the Introduction to Chapter 4, Analysis of Acres Affected by Stipulations. Surface-disturbing activities would have more of an adverse effect on vegetation in Alternative A than Alternatives B, C, and D. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain the Standards for Rangeland Health.

Fire Management and Ecology: An average of approximately 213 acres of BLM land would be treated per year using prescribed fire and 346 acres using mechanical treatment. This is approximately 1 to 2 percent of the roughly 17,500 acres of forested/woodland habitat managed by the BLM in the planning area. The total number of acres of disturbance

would vary slightly between alternatives as shown in Impacts Common to All Alternatives. Overall, the impacts to vegetation would be similar to those discussed under Impacts Common to All Alternatives. Impacts to vegetation would have negligible short-term impacts to vegetation and minor long-term impacts to vegetation.

Lands and Realty: A land transfer could be considered if additional lands are requested by the Black Hills National Cemetery at the Fort Meade ACEC. Impacts to vegetation would be analyzed at the project level once the proposed number of acres to be transferred was established. The native mixed prairie vegetation within the designated number of acres would be converted to non-native vegetation that would be capable of being mowed and groomed continuously.

Livestock Grazing: Livestock grazing would affect vigor and reproduction of palatable (preferred) species. Livestock management actions that enhance the vigor and reproduction of key plant species would benefit those species. Livestock grazing within the Exemption Area would primarily be limited to the 1,349 acres currently grazed with little option for new grazing allotments within the Exemption Area.

Impacts would be same as impacts discussed in common to all alternatives. Overall livestock grazing would have a net minor beneficial short- and long-term impact to vegetation through continued implementation of the Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management for all alternatives. Assessed upland health sites and riparian areas would be expected to continue making significant progress toward meeting the Standards.

Soil Resources: Under Alternative A, approximately 8,575 acres of BLM-administered surface lands would be covered by CSU stipulations in areas with slopes greater than 30 percent (Table 4-26). This alternative would provide the least protection against excessive soil erosion and degradation as Alternative A only applies to oil and gas activities while the other alternatives apply stipulations to oil and gas, renewable energy, and ROWs resulting in fewer acres of restrictions for Alternative A.

The stipulations under Alternative A would still provide protection to soil resources, minimizing potential erosion and therefore reducing the number of sites available for noxious weed establishment. This would help maintain a diverse assemblage of native plant communities. The level of maintained vegetative communities would be considered less than the other alternatives. Beneficial minor short- and long-term impacts would remain as discussed under Impacts Common to All Alternatives.

Travel Management: Travel would be allowed within 300 feet of roads to access campsites, and cross-country travel would be prohibited for big game retrieval. Any cross-country travel would cause physical damage to vegetation by breaking stems and branches and may disturb soil surfaces depending on soil conditions, slope, and ground cover. Usually, with a one-time disturbance, plants and disturbed areas recover. However, with repeated use, new trails would be established resulting in long-term loss of vegetation, soil erosion, and introduction of invasive species. Alternative A would have less impact to vegetative communities than Alternative B and more impact than Alternatives C and D.

Vegetative Communities: Mechanical vegetation treatments would be least limited in Alternative A, with fewer options for mechanical treatment in Alternatives B, C, and D. Fuels reduction efforts in Alternative A would have the least number of acres (346 acres/year) mechanically treated. In the short term, Alternative A would have about the same acreage disturbed as Alternative C with the least opportunity for invasive plants and noxious weeds to spread. In the long term, Alternative A would maximize options to achieve desired vegetative conditions.

Poisonous plants, unless designated as noxious, would not be treated under Alternative A. Poisonous plants would continue to proliferate in areas where growing conditions are favorable for those plants (e.g., cocklebur in riparian areas). Alternative A would maintain the greatest number of poisonous plants within populations since treatments would only occur if plants are designated as noxious.

Water Resources: Alternative A would provide NSO lease stipulations to oil and gas activity on 13,397 acres of BLM-administered surface acres (Table 4-27). Alternatives B, C, and D provide the same NSO lease stipulations on oil and gas activity, with additional ROW avoidance and exclusion areas applied to protect water resources at 14,191 acres. Implementation of NSO lease stipulations for oil and gas activities in areas of floodplains (refer to Glossary) would decrease direct adverse impacts to vegetation (primarily riparian and wetland vegetation) across 13,397 acres under all alternatives. Fewer NSO lease stipulations in Alternative A would result in greater adverse impacts to vegetation (primarily

riparian vegetation) than Alternatives B, C, and D, where NSO lease stipulations and ROW avoidance and exclusion areas apply to more resource uses.

Wildlife and Special Status Species: Prairie dog treatment is least restrictive in Alternatives A, B, and D with options to treat prairie dogs if they are causing significant adverse impacts to soil and vegetative resources. Therefore, less vegetation would be converted to early seral communities in Alternatives A and B as a result of prairie dog expansion. Early seral plant communities contain higher amounts of annual forbs, bare ground and shorter grasses.

Impacts under Alternative B

Climate, Fluid Minerals, Invasive Species Including Noxious Weeds, Recreation, and Solid Minerals: Impacts would be the same as described in Impacts Common to All Alternatives.

Allowing surface-disturbing activities would affect the relative abundance of species within plant communities, distribution of plant communities, and occurrence of seral stages of those communities under this alternative. However, implementation of this alternative would not result in the complete elimination of a plant species, plant community, or seral stage. It would create small-scale desirable conditions for noxious weed infestations.

Under Alternative B, BLM-administered surface land would have 6,574 and 105,837 acres Closed and with NSO lease stipulations for oil and gas production, respectively (Table 4-30). There would not be any acres of ROW exclusion areas (Table 4-31) in Alternative B, although there would be 189,153 acres of ROW avoidance areas. These acres include all stipulations and consider the overlap of various stipulations as described in the Introduction to Chapter 4, Analysis of Acres Affected by Stipulations. Surface-disturbing activities would have less effect on vegetation than Alternative A and a slightly greater effect than Alternative C. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain the Standards for Rangeland Health.

Fire Management and Ecology: A total of an average of approximately 400 acres of BLM land would be treated per year using prescribed fire and 1,000 acres using mechanical treatment. This is approximately 2 to 6 percent of the roughly 17,500 acres of forested/woodland habitat managed by the BLM in the planning area. The total number of acres of disturbance would vary slightly between alternatives as shown in Impacts Common to All Alternatives. Overall, the impacts to vegetation would be similar to those discussed under Impacts Common to All Alternatives with negligible short-term impacts to vegetation and minor long-term impacts to vegetation.

Lands and Realty: A land transfer could be considered for up to 170 acres if additional lands are requested by the Black Hills National Cemetery and 50 acres if requested by the National Guard at the Fort Meade ACEC. Impacts to vegetation would be analyzed at the project level once the proposed acreage to be transferred was established. Native mixed prairie vegetation on 100 acres would be converted to non-native vegetation that would be capable of being mowed and groomed continuously. Fifty acres of smooth brome dominated vegetation would be removed from the site requested by the National Guard since the National Guard would be using the land for buildings and other facilities.

Livestock Grazing: Livestock grazing would affect vigor and reproduction of palatable species. Livestock management actions that enhance the vigor and reproduction of key plant species would cause an increase in those species. The allowance of a five percent increase in AUMs on allotments with improved grazing management would create an incentive for managers to enhance plant vigor, reproduction, and rangeland health overall.

Implementing monitoring through adaptive management on allotments found to exceed 50 percent utilization at the end of the grazing season would allow cause and effect relationships to be identified quickly. Monitoring attributes would be chosen to determine if grazing management is having an adverse effect on soil, biotic, and hydrologic integrity of the monitored area. The established two-year timeline and additional monitoring would ensure that effects of grazing management would be identified prior to management changes taking place. Sites that would be expected to decline in vegetative production, cover, and vigor due to over utilization would be identified before major shifts in vegetative communities could occur. Rangeland health would be maintained or improved through monitoring of such locations and follow up management actions determined at the project level to address identified issues.

Transferring or renewing grazing leases for Maintain (M) and Custodial (C) category grazing allotments (allotments that have met rangeland health standards and have no changes to livestock type or authorized active use) would continue to maintain or improve PFC on riparian and wetland areas and uplands. Improve (I) category allotments would not meet the criteria and would require additional environmental review prior to transfer or renewal of the grazing lease (refer to the Glossary for I, M, and C allotment definitions). Monitoring and evaluating priority allotments which do not meet Standards and Guidelines, contain special status species, and contain FAR downward trend or NF riparian and wetland areas would increase management review to ensure criteria for lease renewals were met. Monitoring of low priority allotments would continue as higher priority allotments are assessed and monitored. Monitoring would include basic information such as field visits and infrequent photo points versus more intensive monitoring of other allotments.

Livestock grazing would be deferred up to one year before prescribed fire to ensure adequate fuel is present to carry a prescribed fire and for a minimum of one growing season following treatment to promote vegetation recovery. Livestock grazing can normally resume by late June, although a lower stocking rate is sometimes recommended (White and Currie 1983). The season of prescribed burn, the existing and desired mix of vegetation, and kind of livestock grazing to occur would be evaluated at the project level to determine the appropriate rest period following fire. Alternatives B and D would have slightly less opportunity for plants to recover from fire before grazing than Alternative C. This would be most evident in bunchgrasses such as green needlegrass.

Providing for a minimum of one growing season of rest from livestock grazing following prescribed fire treatments would have a moderate beneficial short- and long-term impact on vegetative communities at the local scale and a minor to negligible beneficial impact at the planning area scale. The beneficial impacts would be more extensive where sod-forming grasses such as western wheatgrass dominate the landscape and less extensive where bunchgrasses such as green needlegrass are present in higher proportions.

Livestock grazing within the Exemption Area would primarily be limited to 2,957 acres. These acres include current allotments and potential new allotments that would only be permitted when capability criteria are met. Potential for soil erosion on new allotments would be limited through the capability criteria. Grazing allotments would not be allotted in areas of steep slopes where livestock would tend to adversely impact riparian vegetation. Beneficial impacts to vegetation would come from fine fuels reduction which would limit the potential for catastrophic fires.

Renewable Energy: Alternative B would have 189,153 acres of renewable energy ROW avoidance areas, compared to the 199,420 acres of renewable energy ROW exclusion areas in Alternative C (Table 4-31). Fewer restrictions would apply in Alternative B, especially in sagebrush habitat and Greater Sage-Grouse PPAs. It is still projected that only 768 acres of short-term surface disturbance would occur and 192 acres of long-term disturbance from renewable energy development. There would be a greater relative occurrence of early seral plant communities resulting from the short-term disturbance with more long-term impacts including removal of vegetation for roads and tower sites. Impacts to vegetation would be negligible due to the small percentage (0.3 percent) of the decision area being disturbed.

Soil Resources: Under Alternative B, approximately 53,291 acres of BLM-administered surface would be covered by CSU stipulations for oil and gas production in areas with slopes greater than 25 percent and where sensitive soils are present. ROW restrictions would include 57,971 acres of avoidance areas for BLM-administered surface (Table 4-26).

The stipulations under Alternative B would still provide protection to soil resources, minimizing potential erosion and therefore reducing the number of sites available for noxious weed establishment. This would help maintain a diverse assemblage of native plant communities. The level of maintained vegetative communities would be considered slightly more than Alternative A and slightly less than the other alternatives. Beneficial minor short- and long-term impacts would remain as discussed under Impacts Common to All Alternatives.

Travel Management: Travel would be allowed within 300 feet of roads to access campsites and within 300 feet to retrieve big game. Alternative B would have the greatest, although minimal impacts to vegetative communities compared to Alternatives A, C, and D.

Vegetative Communities: Mechanical vegetation treatments in Alternative B would be more limited than Alternative A, and less limited than Alternative C. Fuels reduction efforts would have the most number of acres mechanically treated within Alternative B at 400 acres per year. In the short term Alternative B would have slightly more acres disturbed than

Alternatives A and C which would have more opportunity for invasive plants and noxious weeds to spread. In the long term Alternative B would not limit many options to achieve desired vegetative conditions.

The use of native plant species would be the preferred method used to revegetate or reclaim areas. Non-invasive introduced species that pose little threat of displacing adjacent native vegetative communities could be used for reclamation and to restore vegetation in sites where resource protection (soils, wildlife habitat) would best be met by the use of non-native introduced species. Potentially converting 8,220 acres of native pastures to tame pastures would result in a reduction of native rangelands on up to three percent of the decision area. Seral stage diversity would be reduced under this alternative. Native plant habitat connectivity would be reduced as well. The high cost of native plant species is often a limiting factor to using native species on large scale revegetation efforts (Thompson, et al. 2006).

Using native species or non-invasive seed mixes to protect wildlife habitat and watershed resources, on burned areas, and on sites with high erosion potential would minimize proliferation of noxious weeds (Booth and Vogel 2006). Perennial non-native species may initiate persistent stands, which can inhibit colonization by native herbaceous species (Foster, et al. 2007).

Designating indigenous plant gathering sites would concentrate incidental use of such plants. Plant species being gathered could cause a decline in plant population within a designated area if plant roots are gathered or the plants are gathered prior to setting seed. Impacts to plants species would be minor within plant communities and negligible across the planning area.

Poisonous plants could be treated, where found, using Integrated Pest Management (IPM) (refer to Glossary) methods under Alternatives B and D. Poisonous plants could be treated in areas around noxious weeds or in areas determined to be hazardous to livestock grazing. Alternatives B and D would maintain the fewest number of poisonous plants within populations since treatments could occur where poisonous plants are found.

Converting the non-native grassland plant communities at the Fort Meade ACEC to native vegetation would not occur unless future research determines that a specific course of action has a high probability of success and such methods are within budget and staffing capabilities. At this time research is limited on smooth brome control. The most effective means of converting smooth brome to native species at this time is farming the land for a few years and then planting back to native vegetation.

Water Resources: Alternative B would provide NSO lease stipulations to oil and gas activity and ROW avoidance areas on 30,487 acres, and 14,191 acres of BLM-administered surface, respectively (Table 4-27). Implementation of NSO lease stipulations in areas of floodplains would decrease direct adverse impacts to vegetation (primarily riparian and wetland vegetation) under all alternatives. The application of ROW avoidance areas to more resource uses in Alternative B would result in fewer adverse impacts to vegetation (primarily riparian vegetation) than Alternative A where lease stipulations only apply to oil and gas activity.

Wildlife and Special Status Species: Grazing noxious weeds with livestock supports the desirable plant species success. Restricting this action within five miles of bighorn sheep range would allow some noxious weeds to spread and would affect vegetation. Impacts would be negligible to vegetation as roughly one percent of BLM lands within the planning area are located within five miles of bighorn sheep range.

Reintroduction of prairie dogs on public land would not be considered in Alternative B. No impacts to vegetative communities would occur from this alternative.

Impacts under Alternative C

Climate, Fluid Minerals, Invasive Species Including Noxious Weeds, Recreation, and Solid Minerals: Impacts would be the same as described in Impacts Common to All Alternatives.

Avoiding or restricting surface-disturbing or disruptive activities or requiring power lines be buried would affect the relative abundance of species within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. However, implementation of this action would not result in the complete elimination

of a plant species, plant community, or seral stage. Burying power lines would create small-scale desirable conditions for noxious weed infestations.

Under Alternative C, BLM-administered surface lands would have 100,160 and 43,897 acres Closed and with NSO lease stipulations for oil and gas production, respectively (Table 4-30). There would also be 199,420 acres of ROW exclusion areas (Table 4-31). These acres include all stipulations and consider the overlap of various stipulations as described in the Introduction to Chapter 4, Analysis of Acres Affected by Stipulations. Surface-disturbing activities would have the least effect on vegetation of all the alternatives. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain the Standards for Rangeland Health.

Fire Management and Ecology: An average of approximately 350 acres of BLM land would be treated per year using prescribed fire and 500 acres using mechanical treatment. This is approximately 2 to 3 percent of the roughly 17,500 acres of forested/woodland habitat managed by the BLM in the planning area. The total number of acres of disturbance would vary slightly between alternatives as shown in the Impacts Common to All Alternatives. Overall, the impacts to vegetation would be similar to those discussed under Impacts Common to All Alternatives with negligible short-term impacts to vegetation and minor long-term impacts to vegetation.

Lands and Realty: A land transfer would not be considered for 170 acres if additional lands are requested by the Black Hills National Cemetery and 50 acres if requested by the National Guard at the Fort Meade ACEC. Native mixed prairie vegetation would not be removed from the 150 acres as described in the other alternatives. Therefore, there would be no impact from the action.

Livestock Grazing: Livestock grazing would affect vigor and reproduction of palatable species. Livestock management actions that enhance the vigor and reproduction of key plant species would cause an increase in those species.

Under Alternative C, exceeding utilization levels on an allotment for three consecutive years would trigger management changes without the need for the other forms of monitoring that would be required in Alternatives B and D. In some cases, rangeland health would be better maintained or improved as the BLM would be more responsive to actual conditions; however, in many cases, the BLM would be forced to make a change without full consideration of the additional monitoring information that is required in Alternatives B and D. Overall this requirement would maintain or improve rangeland health to a lesser degree than Alternatives B and D.

Transferring or renewing grazing leases for M and C category grazing allotments (where they have met rangeland health standards and there are no changes to kind of livestock or authorized active use) would continue to maintain or improve PFC on riparian and wetland areas and uplands. Monitoring and evaluating priority allotments which did not meet Standards and Guidelines, contained special status species, or contained FAR downward trend or NF riparian and wetland areas would increase management review to ensure criteria were met for lease renewals. Monitoring of low priority allotments would continue as higher priority allotments are assessed and monitored. Monitoring would include basic information such as field visits and infrequent photo points versus more intensive monitoring of other allotments.

Livestock grazing would be deferred up to one year before prescribed fire to ensure adequate fuel is present to carry a prescribed fire and for a minimum of two growing seasons following treatment to promote recovery of vegetation. Grazing can generally resume on mixed grass prairies after a short deferment period early in the growing season following prescribed fire in the Northern Great Plains (White and Currie 1983). The season of prescribed burn, the existing and desired mix of vegetation, and kind of livestock grazing to occur would need to be evaluated at the project level to determine the appropriate rest period following fire. Alternative C would have more opportunity for plants to recover from fire before grazing than Alternatives B and D. This would be most evident in bunchgrasses such as green needlegrass.

Providing for a minimum of two growing seasons of rest from livestock grazing following prescribed fire treatments would have a moderate beneficial short- and long-term impact on vegetative communities at the local scale and a minor to negligible beneficial impact at the planning area scale. The beneficial impacts would be better distributed between sod-forming grasses such as western wheatgrass and bunchgrasses such as green needlegrass in Alternative C than Alternatives B and D.

Livestock grazing within the Exemption Area would primarily be limited to the 1,349 acres currently grazed with no option for new grazing allotments within the Exemption Area. Impacts to vegetation would be negligible.

Renewable Energy: There would be 199,420 acres of renewable energy ROW exclusion areas in Alternative C compared to the 189,153 acres of renewable energy ROW avoidance areas in Alternative B (Table 4-31). More restrictions would apply in Alternative C than the other alternatives, especially in sagebrush habitat and Greater Sage-Grouse PPAs. It is still projected that only 588 acres of short-term surface disturbance would occur and 78 acres of long-term disturbance from renewable energy development. There would be a smaller relative occurrence of early seral plant communities resulting from the short-term disturbance with negligible long-term impacts resulting from removal of vegetation for roads and tower sites. Impacts to vegetation would be negligible due to the small percentage (0.2 percent) of the decision area being disturbed.

Soil Resources: Under Alternative C, approximately 53,291 acres of BLM-administered surface would be covered by NSO lease stipulations for oil and gas production in areas with slopes greater than 25 percent and where sensitive soils are present. ROW restrictions would include 57,971 acres of exclusion areas for BLM-administered surface (Table 4-26). Modifying CSU stipulations, as under Alternative C, to NSO and increasing ROW avoidance areas to exclusion areas would provide a greater level of protection against excessive erosion and sedimentation. Beneficial minor short- and long-term impacts would remain as discussed under Impacts Common to All Alternatives.

Travel Management: Travel would be allowed within 100 feet of roads to access campsite and cross-country travel would be prohibited for big game retrieval. Alternatives C and D would have the least impacts to vegetative communities compared to Alternatives A and B.

Closing and reclaiming roads and trails not necessary for management when water quality or soil health is likely to be impacted would have a minor beneficial impact on vegetation. Reclaimed sites provide an increase in vegetative cover with less potential for establishment and spread of invasive plants.

Vegetative Communities: Mechanical vegetation treatments would be most limited in Alternative C, with more options for mechanical treatment in Alternatives A, B, and D. Fuels reduction efforts would have the least number of acres mechanically treated within Alternative A at 346 acres per year with Alternative C about the same at 350 acres per year. In the short term, Alternative C would have about the same acres disturbed as Alternative A with the least opportunity for invasive plants and noxious weeds to spread. In the long term, Alternative C may limit the options to achieve desired vegetative conditions.

Using only native species for revegetation of disturbed areas would require intense management for weed control but would provide long-term benefits of little or no maintenance once they are established. Using only native species may stabilize slopes, provide ground cover, and compete with invasive species less quickly than using introduced species. Evidence indicates that some native species such as western wheatgrass may establish as well as some introduced species (Thompson, et al. 2006).

Indigenous plant gathering sites would not be designated. Incidental use would be allowed unless otherwise restricted. Impacts to vegetation would be negligible.

Poisonous plants could be treated only in developed recreation areas and along recreation trails under Alternative C. Poisonous plants would continue to proliferate in sites where growing conditions are favorable for those plants (e.g., cocklebur in riparian areas) outside of recreation areas. Alternative C would maintain a higher number of poisonous plants within populations than Alternatives B and D and less than Alternative A since treatments would only occur in recreation areas. Restricting broadcast herbicide weed treatments around listed threatened, endangered, and sensitive plant species would provide additional protection to such plants. The incidence of non-target species treatment would be limited.

Vegetative management practices would be implemented to eliminate or drastically reduce the levels of non-native herbaceous plant species at the Fort Meade ACEC with the intent to manage strictly for native plant species. At this time research is limited on smooth brome control. The most effective means of converting smooth brome to native species at this time is farming the land for a few years and then planting back to native vegetation. Impact to vegetation would be moderate in the short term with a long-term minor effect where vegetation composition would shift from non-native species to native species.

Water Resources: Alternative C would provide NSO lease stipulations to oil and gas activity and ROW exclusion areas on 30,487 acres and 14,191 acres of BLM-administered surface respectively (Table 4-27). Implementation of NSO lease stipulations and ROW exclusion areas in areas of floodplains would decrease direct adverse impacts to vegetation (primarily riparian and wetland vegetation) across up to 30,487 acres under this alternative. The application of ROW exclusion areas to more resource uses in Alternative C would result in the least adverse impacts to vegetation (primarily riparian vegetation).

Wildlife and Special Status Species: Grazing noxious weeds with livestock supports the desirable plant species success. Restricting this action within 10 miles of bighorn sheep range would allow some noxious weeds to spread and would affect vegetation. Impacts would be negligible to vegetation as less than two percent of BLM lands within the planning area are located within ten miles of bighorn sheep range.

Reintroduction of prairie dogs could be considered on large blocks of public land with a minimum of 10,000 or more contiguous acres and while considering other resources and uses. The impacts to vegetative communities would be analyzed at the project level. A moderate impact to vegetative communities would occur with a noticeable conversion of vegetative communities from mid and later seral to early seral in any area where prairie dogs would be reintroduced on a large scale.

Special Designations: Compared to Alternatives B and D, a sage-grouse PPA ACEC designation in Alternative C would not provide improved vegetation management or protection as management actions are set forth under PPAs under Alternatives B and D, and these measures would be implemented regardless of an ACEC designation for Greater Sage-Grouse PPAs (refer to the Summary of Restrictions Table 2-1).

Impacts under Alternative D (Preferred Alternative)

Climate, Fluid Minerals, Invasive Species Including Noxious Weeds, Recreation, and Solid Minerals: Impacts would be the same as described in Impacts Common to All Alternatives.

Avoiding or restricting surface-disturbing or disruptive activities or requiring power lines be buried would affect the relative abundance of species within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. However, implementation of this action would not result in the complete elimination of a plant species, plant community, or seral stage. Burying power lines would create small-scale desirable conditions for noxious weed infestations.

Under Alternative D, BLM-administered surface lands would have 6,894 and 107,025 acres Closed and with NSO lease stipulations for oil and gas production, respectively (Table 4-30). There would be 5,836 acres of ROW exclusion areas and 191,704 acres of ROW avoidance areas (Table 4-31).These acres include all stipulations and consider the overlap of various stipulations as described in the Introduction to Chapter 4, Analysis of Acres Affected by Stipulations. Surface-disturbing activities would have less of an effect on vegetation than Alternatives A and B and slightly more of an effect than Alternative C. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain the Standards for Rangeland Health.

Fire Management and Ecology: An average of approximately 400 acres of BLM land would be treated per year by prescribed fire and 1,000 acres by mechanical treatment. This is approximately 2 to 6 percent of the roughly 17,500 acres of forested/woodland habitat managed by the BLM in the planning area. The total number of acres of disturbance would vary slightly between alternatives as shown in Impacts Common to All Alternatives. Overall, the impacts to vegetation would be similar to those discussed under Impacts Common to All Alternatives with negligible short-term impacts to vegetation and minor long-term impacts to vegetation.

Lands and Realty: A land transfer could be considered for up to 170 acres if additional lands are requested by the Black Hills National Cemetery and 50 acres if requested by the National Guard at the Fort Meade ACEC. Impacts to vegetation would be analyzed at the project level once the proposed number of acres to be transferred was established. Native mixed prairie vegetation on 100 acres would be converted to non-native vegetation that would be capable of being mowed and groomed continuously. Fifty acres of smooth brome dominated vegetation would be removed from the site requested by the National Guard since the National Guard would be using the land for buildings and other facilities.

Livestock Grazing: Livestock grazing would affect vigor and reproduction of palatable species. Livestock management actions that enhance the vigor and reproduction of key plant species would cause an increase in those species. The allowance of a five percent increase in AUMs on allotments with improved grazing management would create an incentive for managers to enhance plant vigor, reproduction, and overall rangeland health.

Implementing monitoring through adaptive management on allotments found to exceed 50 percent utilization at the end of the grazing season would allow cause and effect relationships to be identified quickly. Monitoring attributes would be chosen to determine if grazing management is having a negative effect on soil, biotic, and hydrologic integrity of the monitored area. The established two-year timeline and additional monitoring would ensure that effects of grazing management would be identified prior to management changes taking place. Sites that would be expected to decline in vegetative production, cover, and vigor due to over utilization would be identified before major shifts in vegetative communities could occur. Rangeland health would be maintained or improved through monitoring of such locations.

Transferring or renewing grazing leases for M and C category grazing allotments (where they have met rangeland health standards and there are no changes to kind of livestock or authorized active use) would continue to maintain or improve PFC on riparian and wetland areas and uplands. Monitoring and evaluating priority allotments which did not meet Standards and Guidelines, contained special status species, or contained FAR downward trend or NF riparian and wetland areas would increase management review to ensure criteria were met for lease renewals. Monitoring of low priority allotments would continue as higher priority allotments are assessed and monitored. Monitoring would include basic information such as field visits and infrequent photo points versus more intensive monitoring of other allotments.

Livestock grazing would be deferred up to one year before prescribed fire to ensure adequate fuel is present to carry a prescribed fire and for a minimum of one growing season following treatment to promote recovery of vegetation. Short deferment of livestock grazing can generally take place following prescribed fire on mixed grass prairies without decreasing production of desirable plant species (White and Currie 1983). Livestock grazing can normally resume by late June, although a lower stocking rate is sometimes recommended (White and Currie 1983). The season of prescribed burn, the existing and desired mix of vegetation, and kind of livestock grazing to occur would need to be evaluated at the project level to determine the appropriate rest period following fire. Alternatives B and D would have slightly less opportunity for plants to recover from fire before grazing than Alternative C. This would be most evident in bunchgrasses such as green needlegrass.

Providing for a minimum of one growing season of rest from livestock grazing following prescribed fire treatments would have a moderate beneficial short- and long-term impact on vegetative communities at the local scale and a minor to negligible beneficial impact at the planning area scale. The beneficial impacts would be more extensive where sod-forming grasses such as western wheatgrass dominate the landscape and less extensive where bunchgrasses such as green needlegrass are present in higher proportions.

Livestock grazing within the Exemption Area would primarily be limited to 2,957 acres. These acres include current allotments and potential new allotments that would only be permitted when capability criteria are met. Potential for soil erosion on new allotments would be limited through the capability criteria. Grazing allotments would not be allotted in areas of steep slopes where livestock would tend to negatively impact riparian vegetation. Beneficial impacts to vegetation would come from fine fuels reduction which would limit the potential for catastrophic fires.

Renewable Energy: There would be 118,904 acres of renewable energy ROW exclusion areas and 78,636 acres of avoidance areas in Alternative D compared to the 189,153 acres of renewable energy ROW avoidance areas in Alternative B and 199,420 acres of renewable energy ROW exclusion areas in Alternative C (Table 4-31). Alternative D combines the restrictions of the other alternatives for an intermediate impact, while still protecting sagebrush habitat and Greater Sage-Grouse PPAs. It is still projected that only 520 acres of short-term surface disturbance would occur and 130 acres of long-term disturbance from renewable energy development. There would be a greater relative occurrence of early seral plant communities resulting from the short-term disturbance with more long-term impacts including removal of vegetation for roads and tower sites. Impacts to vegetation would be negligible due to the small percentage (0.3 percent) of the decision area being disturbed.

Soil Resources: Under Alternative D, approximately 13,132 acres of BLM-administered surface would be covered by CSU stipulations for oil and gas production in areas with slopes between 25-50 percent and less than 1,000 acres would be covered by an NSO stipulation for slopes greater than 50 percent. Under Alternative D, the same CSU stipulation for

39,230 acres would apply for sensitive soils as in Alternative B. ROW restrictions would include 57,971 BLM-administered surface acres of avoidance areas for soils (Table 4-26). Soil management activities would create similar beneficial minor short- and long-term impacts to vegetative communities as under Alternative B.

Travel Management: Travel would be allowed within 100 feet of roads to access campsite and cross-country travel would be prohibited for big game retrieval. Alternatives C and D would have the least impacts to vegetative communities compared to Alternatives A and B.

Vegetative Communities: Mechanical vegetation treatments in Alternative D would be more limited than Alternative A, and less limited than Alternative C as the types of treatments in a given area would be more extensive compared to Alternative A. Fuels reduction efforts would have the most number of acres mechanically treated within Alternatives B and D at 400 acres per year. In the short term, Alternatives B and D would have slightly more acres disturbed than Alternatives A and C which would have more opportunity for invasive plants and noxious weeds to spread. In the long term, Alternatives B and D would not limit many options to achieve desired vegetative conditions.

The use of native plant species would be the preferred method used to revegetate or reclaim areas. Non-invasive introduced species that pose little threat of displacing adjacent native vegetative communities could be used for reclamation and to restore vegetation in sites where resource protection (soils, wildlife habitat) would best be met by the use of non-native introduced species. Potentially converting 2,740 acres of native pastures to tame pastures would result in a reduction of native rangelands in up to one percent of the decision area. Seral stage diversity would be reduced under this alternative. Native plant habitat connectivity would be reduced as well. The high cost of native plant species is often a limiting factor to using native species on large-scale revegetation efforts (Thompson, et al. 2006).

Using native species or non-invasive seed mixes to protect wildlife habitat and watershed resources, on burned areas, and on sites with high erosion potential would minimize proliferation of noxious weeds (Booth and Vogel 2006). Perennial non-native species may initiate persistent stands, which can inhibit colonization by native herbaceous species (Foster, et al. 2007).

Indigenous plant gathering sites would not be designated. Incidental use would be allowed unless otherwise restricted. If plant gathering is found to be causing negative impacts to resources within gathering areas as determined by an interdisciplinary team, the BLM could restrict gathering within those areas. Impacts to vegetation would be negligible.

Poisonous plants could be treated, where found, using IPM methods under Alternatives B and D. Poisonous plants could be treated in areas around noxious weeds or in areas determined to be hazardous to livestock grazing. Alternatives B and D would maintain the fewest number of poisonous plants within populations since treatments could occur where poisonous plants are found. Restricting broadcast herbicide weed treatments around listed threatened, endangered, and sensitive plant species would provide additional protection to such plants. The incidence of non-target species treatment would be limited.

Water Resources: Alternative D would provide NSO lease stipulations to oil and gas activity and ROW avoidance areas on 30,487 and 14,191 acres of BLM-administered surface respectively (Table 4-27). Implementation of NSO lease stipulations and ROW avoidance areas in areas of floodplains would have no direct adverse impacts to vegetation (primarily riparian and wetland vegetation) across up to 30,487 acres under this alternatives. The application of ROW avoidance areas to more resource uses in Alternative D than Alternative A would result in fewer adverse impacts to vegetation (primarily riparian vegetation) than Alternative A with similar adverse impacts to Alternative B.

Wildlife and Special Status Species: Grazing noxious weeds with livestock supports the desirable plant species success. Restricting this action within 10 miles of bighorn sheep range would allow some noxious weeds to spread and would affect vegetation. Impacts would be negligible to vegetation as less than two percent of BLM lands within the planning area are located within 10 miles of bighorn sheep range.

Prairie dogs could be considered for reintroduction on historic colony sites or large unfragmented blocks of public land where there are cooperating adjoining land owners and a minimum of 10,000 or more acres of public land that could include acquired land. There would also be a one mile no prairie dog buffer from adjoining private land, and while considering other resources and uses. The impacts to vegetative communities would be analyzed at the project level. A moderate impact to vegetative communities would occur with a noticeable conversion of vegetative communities from mid and later seral to early seral in any area where prairie dogs would be reintroduced on a large scale.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present actions that affect and have affected vegetative communities include mineral exploration and development, Lands and Realty surface-disturbing ROWs, livestock grazing, and vegetation treatments. In general, these actions have all had cumulative adverse impacts on vegetative communities by creating surface disturbance that results in a greater percentage of bare ground, causing soil erosion, increased runoff, altered riparian communities, destabilized stream banks, vegetation loss, and fragmentation of landscapes. Beneficial impacts include vegetation treatments that improve vegetative cover, diversity, and production in the long term. All counties within the planning area have noxious weed control programs. These programs have a beneficial cumulative impact to native and desired plant communities.

Over the life of the plan 1,400 acres of upland and approximately four miles of riparian areas are expected to improve through the implementation of Standards for Rangeland Health. This would increase plant diversity and ground cover thereby reducing erosion. It would also allow plant communities to become more drought resilient and provide diverse plant communities for a wide array of ecosystem services. Improved rangeland condition on the 1,400 acres and four miles of riparian areas would indicate an improvement in surrounding private and other non-BLM-administered lands due to the fragmented land pattern. The number of acres affected would vary by pasture size.

BLM-administered land not meeting Standards for Rangeland Health would continue to be equal to or less than 16,400 acres, mainly as a result of introduced plant species such as smooth brome, crested wheatgrass, and annual bromes referred to as cheatgrass. The areas where smooth brome and crested wheatgrass have invaded would continue to see a spread of these species into surrounding areas. Areas that have been assessed for Standards for Rangeland Health that are not meeting the Standards due to cheatgrass would see a cyclical pattern of increases and decreases in brome abundance. Cheatgrass generally becomes abundant when fall moisture is high followed by dry spring and summer months.

Private and other non-BLM-administered lands have major impacts to riparian reaches on BLM-administered lands. This results from the comingled land ownership where most stream reaches contained on BLM land are less than one mile in length with private or other non-BLM-administered lands on either side of the reach. Capability issues are affecting a majority of the streams that were rated as FAR. Of the 16 miles rated as FAR or NF, approximately 13 miles are not meeting PFC due to capability issues; upstream activities on private land, flow control (dams), and historical alteration of the stream channel. A portion of the FAR determinations were attributed to drought as a capability issue.

It is expected that the approximately 13 miles rated as FAR or NF due to capability issues arising from lands other than BLM, would continue to not meet PFC due to land management on other lands. The BLM would coordinate with other landowners to implement practices to improve riparian conditions toward PFC on all lands that are not meeting PFC. RFD actions in the planning area and on federal, state, private, and other lands within and adjacent to the planning area that could adversely impact vegetative communities include ongoing mineral exploration, development and production, and renewable energy development.

The areas considered in the analysis in this section are the nine counties with substantial amounts of BLM surface and mineral estate (Harding, Butte, Lawrence, Pennington, Custer, Fall River, Meade, Perkins, and Stanley counties). Wheat, flax, hay, and sunflowers are the major crops produced on private land in this area. Of the 12.7 million acres in these counties about 50 percent of the area is rangeland.

Compared to other areas, the Northern Great Plains is experiencing a high conversion rate of grasslands to croplands (USDA, Economic Research Service, 2007). Between 1997 and 2007, USDA estimated that 1.1 percent of rangeland was lost due to cropland conversion in a 77 county study area that was completed for portions of North and South Dakota and western Nebraska (USDA Economic Research Service, 2011). Major factors that influenced this trend include changes in market incentive loans, changes in farm programs such as CRP and changes in crop disaster insurance. Other major factors include market factors, interest rates, production costs and increased yield as a result of improved technology.

Based on information in the 2011 USDA report and a review of Natural Agriculture Statistics data, Resources Inventory on planted acres, the BLM estimates that a maximum of 66,000 acres of rangeland on privately owned surface are likely to be converted to cropland in the nine counties listed above over the next ten years. If trends continue in this manner, a

maximum of 132,000 acres of rangeland may be converted to cropland over the next 20 years. The majority of this conversion would result in surface disturbance, although certain farm practices such as no-till farming and other conservation practices would reduce the degree of disturbance. The acres provided are the maximum number of acres that are expected to be converted from grassland to cropland; actual acres may be lower in certain counties such as western Butte County where soils have lower potential for farming. In addition, areas with marginal soils that receive less than 16 inches of annual precipitation may receive lower levels of conversion of rangeland to croplands. In the nine-county area, the BLM estimates that wind energy development would result in up to 3,500 acres of short-term disturbance and 900 acres of long-term disturbance on lands that are not administered by the BLM (other federal lands, private, state, tribal lands, etc.). The maximum levels of wind energy development on BLM-administered surface estate are expected to result in 924 acres of short-term disturbance and 231 acres of long-term disturbance.

The BLM estimates that the conversion of all lands in these counties for other uses such as transportation, infrastructure, and building would occur at a much lesser rate than conversion of rangeland to farm land; however, specific figures are not available. On a nationwide basis, USDA has determined that urban land acreage increased at about twice the rate of population growth in the years 1945 to 2007 (USDA 2007). Urban growth in the nine-county analysis area described in this section is expected to be slow as many of the counties are experiencing slow, static or declining population changes. For example, the population of Harding County in northwest SD declined by seven percent and the population of the county seat (Buffalo, SD) declined by 13 percent from 2000 to 2010. The exception to this trend is the northern Black Hills and areas nearby along the Interstate 90 corridor where subdivision, infrastructure development, and population growth is much higher than in other portions of the nine-county cumulative analysis area. For more information about the population growth by area, refer to the Population portion of the Social section of Chapter 3.

Oil and gas development could result in a maximum of 2,380 acres of short-term disturbance (449 wells) and 1,437 acres of long-term disturbance on other (non-BLM-administered) lands in the nine-county area.

Oil and gas development on BLM-administered federal minerals (including BLM surface estate) is expected to result in a maximum of 138 to 301 acres of long-term surface disturbance (43-94 wells). Development of other BLM-administered minerals is expected to result in a maximum of 400 acres of short-term disturbance and 100 acres of long-term disturbance in the nine-county area. Bentonite mining would account for most of the acres disturbed.

Table 4-32 was developed using a combination of sources including the USDA reports cited above (USDA 2007, 2011, 2012), conversations with the mining industry (2010-2012), SD DENR (2012), and the SD RMP development scenarios including the Oil and Gas RFD. The table represents the maximum number of acres impacted under any alternative.

The amount of disturbance and therefore potential for weed spread and conversion of native plants to non-native plants on BLM-administered surface estate only would range from 325 to 376 acres (0.00003 percent of the nine counties) of short-term disturbance and 1,950 to 2,290 acres (0.0002 percent of the nine counties) of long-term disturbance under the various alternatives (long-term disturbance is the amount of short-term disturbance that is not reclaimed). The expected levels of surface disturbance from all sources on BLM-administered surface estate are shown in Table 4-23 and also described in the development scenarios at the beginning of this chapter. Under any of the management alternatives, the level of adverse cumulative impacts to vegetation would be negligible because 1) disturbance on BLM surface and mineral estate would be very small in relation to the landscape affected; 2) the disturbance would occur in different watersheds over a 20 year period; and 3) 80-85 percent of the disturbance would be reclaimed.

Actions that result in short-term surface disturbance on both BLM surface and mineral estate (split estate) would range from 4,637 to 5,067 acres of short-term disturbance and 811 to 887 acres of long-term disturbance under the various alternatives. In terms of short-term disturbance, this amounts to a 0.0004 percent of the 12.7 million acres in the nine-county analysis area. In terms of long-term disturbance, this amounts to 0.00007 percent of the 12.7 million acres in the nine-county analysis area.

Cumulative Impacts under Alternative A (Current Management)

Alternative A would result in similar levels of vegetation disturbance as described in Cumulative Impacts Common to All Alternatives, in addition to following impacts. Under Alternative A, it is anticipated that up to 1,966 acres (less than one percent of the 274,000 decision area) of short-term surface disturbances could occur on BLM-administered surface over the next 20 years (Tables 4-23 and 4-24). The majority of impacts would result from renewable energy development. Surface

disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 376 acres of long-term soil disturbance.

Surface-disturbing activities would result in a reduction of perennial vegetative cover and create open spaces for noxious weeds and other invasive species to establish.

The difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to vegetative resources are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Cumulative Impacts under Alternative B

Alternative B would result in similar levels of vegetation disturbance as described in Cumulative Impacts Common to All Alternatives, in addition to the following impacts.

Potentially converting 8,220 acres of native pastures to tame pastures would result in a reduction of native rangelands on up to three percent of the decision area. It is estimated that less than one percent (2,740 acres) of the decision area has previously been converted to tame grass species; mainly a result of the spread of crested wheatgrass and smooth brome from surrounding private lands onto small BLM parcels of 160 acres or less. Seral stage diversity could be reduced cumulatively on up to 10,960 acres or four percent of the decision area under this alternative. Native plant habitat connectivity would be reduced as well.

Under Alternative B, it is anticipated that up to 2,174 acres (less than one percent of the 274,000 decision area) of short-term surface disturbances could occur on BLM-administered surface over the next 20 years (Tables 4-23 and 4-24). The majority of impacts would result from renewable energy development. Surface disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 325 acres of long-term soil disturbance.

Surface-disturbing activities would result in a reduction of perennial vegetative cover and create open spaces for noxious weeds and other invasive species to establish.

The difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to vegetative resources are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Cumulative Impacts under Alternative C

Alternative C would result in similar levels of vegetation disturbance as described in Cumulative Impacts Common to All Alternatives, in addition to the following impacts.

It is estimated that less than 1 percent (2,740 acres) of the decision area has previously been converted to tame grass species; mainly a result of the spread of crested wheatgrass and smooth brome from surrounding private lands onto small BLM parcels of 160 acres or less. Seral stage diversity could slowly be reduced as tame grass species continue to spread onto native mixed grass prairie. No additional acres would be converted to tame species on BLM-administered lands; therefore, seral stage diversity due to tame species would be limited. Native plant habitat connectivity would remain intact at the current level.

Under Alternative C, it is anticipated that up to 1,651 acres (less than one percent of the 274,000 decision area) of short-term surface disturbances could occur on BLM-administered surface over the next 20 years (Tables 4-23 and 4-24). The majority of impacts would result from renewable energy development. Surface disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 237 acres of long-term soil disturbance.

Surface-disturbing activities would result in a reduction of perennial vegetative cover and create open spaces for noxious weeds and other invasive species to establish.

Compared to Alternatives A, B and D, an ACEC designation of PPAs combined with closure/withdrawal of minerals and ROW exclusion would create a tendency for project proponents to move the location of proposed infrastructure or use to private or non-federal lands within the sage-grouse ACEC. When this occurs, the BLM would lose control over project

design features and mitigation of site specific impacts, and the BLM would not be able to require disturbed areas to be reclaimed. With the exception of the trade-offs related to Greater Sage-Grouse PPAs, the difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to vegetative resources are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D would result in similar levels of vegetation disturbance as described in Cumulative Impacts Common to All Alternatives, in addition to the following impacts.

Potentially converting 2,740 acres of native pastures to tame pastures would result in a reduction of native rangelands on up to one percent of the decision area. It is estimated that less than one percent (2,740 acres) of the decision area has previously been converted to tame grass species; mainly a result of the spread of crested wheatgrass and smooth brome from surrounding private lands onto small BLM parcels of 160 acres or less. Seral stage diversity could be reduced cumulatively on up to 5,480 acres or two percent of the decision area under this alternative. Native plant habitat connectivity would be reduced as well.

Under Alternative D, it is anticipated that up to 2,290 acres (less than one percent of the 274,000 decision area) of short-term surface disturbances could occur on BLM-administered surface over the next 20 years (Tables 4-23 and 4-24). The majority of impacts would result from renewable energy development. Surface disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 354 acres of long-term soil disturbance.

Surface-disturbing activities would result in a reduction of perennial vegetative cover and create open spaces for noxious weeds and other invasive species to establish.

The difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to vegetative resources are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Noxious Weeds and Other Invasive Species

Actions that contribute to increases in abundance and distribution of noxious weeds and invasive species are considered adverse impacts. Beneficial impacts include actions that protect, restore, or otherwise aid existing vegetative and wildlife communities in resisting invasion.

Direct impacts to noxious weeds result from actions that disperse weed seeds and/or reproductive plant material into uninfested areas, cause surface disturbance in or around infested areas, or a combination of both. Direct impacts from noxious weeds include direct effects on the system being invaded, which can be beneficial and/or adverse. For example, some noxious weeds and invasive plant species can act to bind soil and contribute to stability while others are capable of increasing bare soil and the probability of erosion.

Indirect impacts to noxious weeds and invasive plant species are those actions that cause surface disturbance or otherwise change the function or structure of existing systems that either favor or discourage invasion without providing invading plant material. Indirect impacts from invasive species are those impacts that are secondary to the impacts to system functionality. An example of indirect impacts from invasive species would be loss of carrying capacity for livestock and its associated economic impact due to loss of desirable vegetation caused by invasive species encroachment.

Introduction of invasive invertebrates, vertebrates, microorganisms, plants and pathogens can threaten ecosystem stability, create serious human health consequences, and cause substantial economic burden. A large majority of native and non-native species do not pose a threat to natural or human systems. However, if any of these species became a concern, the BLM would cooperate and coordinate with appropriate government agencies, private industry, and other interested parties involved in public education efforts and control, management, and research of invasive species.

Over the life of the RMP, certain noxious weeds, invasive plant species, and invasive invertebrates, vertebrates, microorganisms, and pathogens would not be eradicated due to constant supply from a multitude of sources. The demand

for weed and invasive species control is expected to increase as public knowledge of the adverse effects of noxious weeds and invasive species increases, as new species are introduced and existing populations expand.

Assumptions

The following assumptions are made for this impacts analysis:

Increases in noxious weeds and invasive plants would reduce vegetative habitat quality and quantity.

Surface disturbances and roadways substantially increase the probability of introduction and establishment of noxious weeds and invasive plant species.

The expansion of invasive invertebrates, vertebrates, microorganisms, and pathogens species would most likely continue at the present rate.

Waterways, wildlife, and humans are the primary pathways for introduction of invasive species.

Noxious weeds and invasive species can be impacted by alternative actions as well as act as an impact to other resources and resource uses.

Management of existing noxious weeds and invasive species would be long-term (over 10 years) and in many instances perpetual.

Integrated Pest Management would be the management strategy for all invasive species-related issues.

Standard Operating Procedures and mitigation measures that have been developed for resources/resource use activities would be followed when these activities are implemented.

Impacts Common to All Alternatives

Climate: Potential changes in climate that affect temperature and precipitation would affect plants and plant communities. Changes to seasonal weather patterns, ambient air temperatures, carbon levels, and the timing and amount of precipitation could result in direct, long-term impacts to many plant communities. Since the type or degree of climate change is not fully understood at this time, determining impacts to individual plant communities is difficult.

An increase in weeds, diseases, and insect pests would likely occur as they may all benefit from warming, with weeds also benefiting from a higher carbon dioxide concentration. This would lead to increasing plant stress, requiring more attention to weed and pest control. Agricultural producers are likely to respond to more aggressive and invasive weeds, insects and pathogens with increased use of herbicides, insecticides, and fungicides. Where increases in water and chemical inputs become necessary, this would increase costs for the producer, as well as having society wide impacts by depleting water supply, increasing reactive nitrogen and pesticide loads to the environment, and increasing risks to food safety and human exposure to pesticides (http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/climate-change-impacts-by-sector). Adaptation to changing conditions through adaptive management practices would provide the best means to reduce adverse impacts to vegetative communities.

Soil Resources: Actions that conserve the soil by mitigating surface-disturbing activities and retaining vegetative cover would limit the introduction and spread of noxious weeds and invasive plant species. Proper road maintenance and conditions placed on land use authorizations and surface-disturbing activities would limit the introduction and spread of noxious weeds and other invasive plant species. Reclamation plans for approved surface-disturbing activities would reduce noxious weed seed spread through use of certified weed seed-free seed mixtures and certified weed free mulch.

Vegetative Communities: Crested wheatgrass is an invasive non-native species that has been used a great deal over the past century to stabilize soils and for use as forage. However, controlling existing crested wheatgrass stands in the attempt to convert them to native species may be difficult and take three or more years of treatments to accomplish. Disturbance from this type of effort would open up areas to invasion from other undesirable plant species.

Vegetation management that meets Rangeland Health Standards for livestock grazing also supports endangered species, wildlife, water quality and fisheries, and would enhance native vegetation and its ability to outcompete noxious weed and invasive non-native plant species development and spread.

Fire Management and Ecology: Wildfires and prescribed fires have impacts on grassland, shrubland and forest communities. In the short term, fire can cause habitat loss and may promote the spread of noxious weeds and invasive plant species. In the long term, because of fire's historic role in these communities, fire would increase vegetative diversity, rejuvenate decadent plants, and improve the overall health of these communities. Prescribed fire is also one of the integrated weed management treatment options.

Forest and Woodland Products: Allowing woody and non-woody biomass product removal, commercial or personal use from forest and woodlands, or salvage of dead and dying timber has the potential to spread noxious weed seed in the removal process. The SDFO weed management plan, BMPs, and mitigation measures would be incorporated into all forest and woodland project plans.

Allowing mechanical thinning, biomass removal, chemical, and biological treatments to woody and non-woody vegetation as a means to reduce hazardous fuels would also aid in noxious weed treatment by removing dense vegetation and improving accessibility to those weed areas requiring treatment. In addition, these management actions would improve stand density and susceptibility of ponderosa pine, reducing the threat from declared pest species such as the Mountain Pine Beetle and Ips Bark Beetle.

Wildlife, Special Status Species, and Livestock Grazing: Continued efforts to manage noxious weeds and invasive species would improve biodiversity, watershed function, and rangeland health.

Wildlife and livestock would contribute to the spread of weeds. Weed seeds could either become attached to the animal or be ingested and transported to other areas. Areas where animals concentrate and disturb the soil would be particularly vulnerable to infestations of weeds. Range improvements for both wildlife and livestock management objectives that disturb the soil surface would provide locations for undesirable plants to become established. Overutilization of native and desirable vegetation in areas could increase the susceptibility of an area to weed infestation. However, grazing plans that promote healthy rangelands and vegetation would create conditions resistant to the spread of weeds.

Currently, the use of domestic sheep and goats as a weed control measure is limited primarily to the northwest portion of the planning area (Butte and Harding counties), and does not occur in bighorn sheep habitat. A potential effect to the management of noxious weeds and other invasive plants via non-classical biological control in proximity to bighorn sheep populations is that this method of control would be made unavailable for future projects. However, current information indicates that there would be little, if any, conflict because treatable infestations and bighorn sheep habitat currently do not overlap.

Treatments to control noxious weeds in sage-grouse habitat would include timing and treatment restrictions to minimize temporary effects to sage-grouse from treatments. Range improvements that include water development would be managed to reduce the spread of invasives such as the West Nile virus within sage-grouse habitat. Grasshopper treatments in sage-grouse habitat would only be conducted when infestations reach a point they are creating economic or environmental harm (habitat destruction).

Noxious Weeds and other Invasive Species: Although potential exists for the introduction and establishment of noxious weeds and other invasive non-native plant species from many of the current and proposed actions throughout the range of alternatives, mitigation measures are already in place for these types of activities. Measures such as weed management standard operating procedures, conservation measures, and the mitigation measures found in the Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic EIS and ROD (BLM 2007c), would decrease the potential or real spread of noxious weeds and other invasive non-native plant species, regardless of the variation in acres disturbed across the proposed alternatives. Preventative measures such as washing boats before transporting to another water body and draining water from bait buckets, live wells, and boat motors before leaving any water body would decrease the potential introduction and/or spread of aquatic invasive species (http://gfp.sd.gov/wildlife/nuisance/aquatic/default.aspx).

Maintaining consistency for vegetative manipulation (or prescriptive) treatments (chemical, fire, biological, manual, and mechanical) with the guidelines as stated in the Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic EIS and ROD (BLM 2007c) and the Vegetation Treatment on BLM Lands in Thirteen Western States Final EIS (BLM 1991) would pursue noxious weed inventory, treatment, and monitoring using an integrated weed management approach in each alternative.

To reduce impacts from invasive aquatic species, guidelines as stated in the National Invasive Species Management Plan (http://www.invasivespecies.gov/main_nav/mn_NISC_ManagementPlan.html) and the South Dakota Aquatic Nuisance Species Management Plan (http://gfp.sd.gov/wildlife/nuisance/aquatic/SDANS-management-plan.aspx) would be pursued for the detection, monitoring, prevention and control of aquatic nuisance species (ANS).

Continued implementation of current management of noxious weeds would help prevent the introduction and establishment of new species in the area. Widely distributed species such as leafy spurge, field bindweed, and Canada thistle would continue to persist. Containment efforts for these species would be perpetual and would require the cooperation of other landowners to accomplish this goal. The same may be said for other invasives such as Viral Hemorrhagic Septicemia, and the aquatic invasives Zebra and Quagga mussels.

Any new herbicides proposed for use that are not approved in the Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic EIS (BLM 2007c) would require a detailed environmental and risk analysis prior to approval for use. All pesticides proposed for use for prairie dog, grasshopper, or mosquito control would require a detailed environmental and risk analysis must be approved and registered with the EPA.

Recreation and Travel Management Areas: Special recreation management areas are or have the potential to become destination areas for visitors outside the region. The potential for the introduction and spread of noxious weeds and the introduction of invasive species would be higher in these areas.

These areas would be easier to monitor for new infestations because they are defined. Areas that are designated for OHV use would be monitored regularly for new introductions similar to other special recreation management areas.

Minerals: Surface-disturbing activities would impact invasive species to varying degrees depending on the amount, location, and type of disturbance. Surface-disturbing activities remove protective vegetative cover and can alter soil physical, chemical, and biological properties; resulting in increased susceptibility to water and wind erosion, and decreased soil quality and site productivity. These activities are mitigated through standard operating procedures, BMPs, and stipulations. Implementation of these mitigation measures would decrease any potential or real spread of noxious weeds and other invasive non-native species regardless of the variation in acres disturbed across the proposed alternatives.

Lands and Realty: Any new acquisition of lands or easements would need to be inventoried for noxious weeds to determine the impact and cost of management of that parcel. Any disposal lands would have to be inventoried for the presence of noxious weeds to disclose this information according to BLM policy. Noxious weed effects on ROWs would be mitigated by stipulating that the responsibility for weed control and prevention be on the holder until the ROW is abandoned and successfully rehabilitated.

Renewable Energy: Noxious weeds would be affected by surface-disturbing activities associated with solar, wind, and biomass energy development. The impact would vary depending on the amount, location and type of disturbance. The introduction and spread of noxious weeds and invasive plant species is most likely to occur from the creation and or use of roads associated with renewable energy development. Other disturbances such as solar panels, wind turbines, and their associated facilities also create the potential for the introduction and spread of noxious weeds. The extent of potential infestation would be relative to the amount of acreage available for renewable energy development in each alternative and the types of NSO and/or CSU stipulations prescribed. However, under all alternatives, weed control and management would be a requirement of the wind energy ROW which would serve to lessen impacts.

Impacts under Alternative A (Current Management)

Wildlife

Bighorn sheep: This alternative does not have a specific management action identified that would have an impact on noxious weeds or invasive species. Therefore, no comparison to Alternatives B, C, and D was made. It is anticipated impacts would be similar in nature and have a negligible effect when compared to Alternatives B, C, and D.

Raptors: This alternative does not have a specific management action identified that would have an impact on noxious weeds or invasive species. Therefore, no comparison to Alternatives B, C, and D was made. It is anticipated impacts would be similar in nature and have a negligible effect when compared to Alternatives B, C, and D.

Special Status Species

Raptors: This alternative does not have a specific management action identified that would have an impact on noxious weeds or invasive species. It is anticipated impacts from raptors would be negligible.

Greater Sage-Grouse: Alternative A is the most restrictive alternative for the treatment of noxious weeds. No noxious weed treatments would be allowed within the two-mile buffer zone of suitable nesting habitat from March 1 to June 30 annually. Alternatives B, C, and D, although they have a more restrictive buffer zones (3 miles, 4 miles, and 3 miles, respectively), all allow spot treatments within those buffer zones from March 1 to June 30 annually. It is anticipated that sage-grouse protection would have a negligible adverse impact on noxious weeds and invasive species.

Greater Sage-Grouse PPAs: Alternative A has no established PPAs. Without the establishment of PPAs under this alternative, no weed treatments would occur within suitable nesting habitat or within a two-mile buffer zone of known sage-grouse leks from March 1 to June 30. Alternative A has the highest potential impact on noxious weeds because no weed treatments would occur within the two-mile buffer zone of suitable nesting habitat (47,857 acres) of known sage-grouse leks from March 1 to June 30. Alternative B would allow spot treatments only within suitable nesting or brood-rearing habitat of known leks on PPAs (7,233 acres), and Alternatives C (13,548 acres) and D (7,233 acres) would allow for spot treatments within suitable nesting or brood-rearing habitat from March 1 to June 30.

Prairie Dogs: Alternative A, being the least restrictive, would result in the highest number of acres of prairie dog towns, potentially resulting in the highest probability for introduction and spread of noxious weeds due to a decrease in standing crop biomass, litter, and plant species richness, as well as an increase in bare ground. Repeated clipping by prairie dogs, which could be compared to repeated heavy grazing, often results in lower overall plant productivity and a change in seral stage (Wambolt and Sowell 2004). Because no specific management action has been developed that identifies the total acreage of prairie dog towns that may be treated on public land each year, Alternative A has the highest probability for the introduction and spread of noxious weeds. Alternatives B and D state that no more than 15 percent, or approximately 296 acres would be treated annually. Alternative C states that no more than 10 percent or approximately 198 acres could be treated annually. Under Alternative A, treatment would only be considered in cases where prairie dog colonies originate on public land and spread onto private land. This is only possible if the adjoining landowner is willing to enter into an agreement to control prairie dogs on his land at the same time they are being controlled on public land. Under Alternatives B, C, and D, treatment would be considered if prairie dogs are causing adverse impacts to soil and vegetative resources or other resources and/or threats to public health and safety. It was determined that endogenous and continuous disturbance within prairie dog towns were exploited by both invasive and native weedy plants. This study also determined that trails within prairie dog towns had even greater potential to introduce invasive species (Larson 2003). Treatment of any prairie dog colony that exists on both public and private land would be considered through project level planning when the adjoining landowner is controlling the prairie dogs on their land. It is anticipated that impacts would be similar in nature and have a minor effect in comparison to Alternatives B, C, and D.

Fire Management and Ecology: Alternative A has the lowest potential impact on noxious weeds and invasive plant species when compared to Alternatives B, C, and D. Under this alternative, the lowest number of acres (569 acres – 213 acres/prescribed fire and 246 acres mechanical) would be disturbed through treatments as compared to Alternative B (1,400 acres – 1,000 acres/prescribed fire and 400 acres mechanical), Alternative C (850 acres – 500 acres/prescribed fire and 350 acres mechanical), and Alternative D (1,400 acres – 1,000 acres/prescribed fire and 400 acres/mechanical). This alternative

also identifies the limitation by heavy equipment and off-road vehicles to existing roads and trails for rehabilitation, which is not specified in Alternatives B, C, and D. Conversely, Alternative A would have the highest potential impact from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, compared to Alternatives B, C, and D because less acreage would be treated. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives B, C, and D.

Forest and Woodland Products: Alternative A would have a lower potential impact on noxious weeds and invasive plant species based on ground disturbance caused by road construction to remove forest and woodland products compared to Alternatives B and D, and similar to Alternative C. Alternative A would allow roads to be constructed to the minimum standard for product removal, unless the roads are needed for other purposes requiring a higher standard. Alternatives B and D would allow new permanent roads to be built for long-term management of areas where multiple entries would be necessary for multiple use management. New road construction would be kept to the minimum necessary for multiple use management. Alternative C would not allow permanent roads to be constructed for forest management. Under Alternatives B, C, and D, temporary road construction would be allowed, kept to a minimum, and decommissioned as part of the project. In addition, Alternatives B and D would allow for rerouting and maintenance of existing authorized roads to reduce impacts to resources. Alternative A has a Probable Sale Quantity (PSQ) estimated at 7,000 tons/year and is the same for Alternatives B and D, which would suggest that the number of acres disturbed by sales would be similar in comparison. Alternative C is estimated at 6,000 tons/year, which would suggest that the number of acres disturbed by sales would be less. Conversely, this alternative would have slightly less potential impact than Alternative C from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, because of the larger volume of product that would be removed under PSQ, and the same potential impact as Alternatives B and D. It is anticipated that impacts would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives B, C, and D.

Livestock Grazing: Livestock grazing would continue to occur within the majority of the planning area under all alternatives. Alternative A would have a slightly lower, but negligible potential impact on noxious weeds based on the number of BLM-administered surface acres available for grazing (271,000 acres), which is the same as Alternative C. Alternatives A and B are similar to Alternatives B and D, which have 272,000 acres. Since the number of acres available for grazing varies less than .05 percent among all alternatives, the acreage available for grazing would be considered the same from a potential noxious weed impact for Alternatives A, B, C, and D.

Rangeland improvement projects, such as fencing and water development, also occur under all alternatives, with three improvements anticipated annually. Impacts would be the same for Alternatives A, B, C, and D.

Range improvement water development projects in close proximity to sage-grouse leks would have the potential to increase risk of pathogens, such as the West Nile virus, and would be analyzed at the project level before being implemented. NRCS guidelines on water development state no pits or reservoirs within 1/2 miles of leks and no development from March 15 – July 15 (NRCS Range Improvement Guide 2010). By analyzing the project prior to implementation and following NRCS guidelines, it is anticipated that impacts would be similar in nature and are negligible in comparison to Alternatives B, C, and D.

Recreation: Alternative A would have the lowest potential impact on noxious weeds and invasive species compared to Alternatives B, C, and D. Alternative A does not have a SRMA designation or Recreation Setting Characteristic (RSC) identified. This leaves recreational development uncertain, creating less potential for introduction and spread of noxious weeds, since recreational opportunities would be lower than Alternatives B, C, and D. Other management actions identified in Alternative A such as motorized cross-country travel for camping are the same (300 feet) as Alternative B, but greater than Alternatives C and D, where travel is limited to 100 feet. Big game retrieval, which is prohibited in Alternatives A, C and D, is allowed up to 300 feet in Alternative B. These management actions are similar enough in comparison that they were not considered in predicting potential impacts to noxious weeds from recreation. It is anticipated that impacts would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives B, C, and D.

Travel Management and OHV: This alternative has a higher potential impact on noxious weeds than Alternative C, but a lower potential than Alternatives B and D, based on construction of new permanent roads, temporary roads and rerouting of existing roads, which would create ground disturbance. In Alternative A, roads would be constructed to the minimum standard necessary, unless the roads would be needed for other purposes requiring a higher standard, and there is no language/management action that identifies the type of road (new permanent or temporary), nor allowances for rerouting of roads. Alternative C would not allow construction of any new permanent roads except as required by law, regulation, or

policy but does allow for temporary road construction. Alternatives B and D would allow construction of new permanent roads for long-term management of areas where multiple entries would be necessary to meet objectives. Rerouting and maintenance of existing authorized roads would be allowed and temporary road construction could be authorized. It is anticipated that impacts would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives B, C, and D.

Lands and Realty: For impacts, see text above under Impacts Common to All Alternatives. Any new acquisition of lands or easements would need to be inventoried for invasive species to determine the impact and cost of management of that parcel. Any disposal lands would have to be inventoried for the presence of noxious weeds in order to disclose this information according to BLM policy. Noxious weed effects on rights-of-way would be mitigated by stipulating that the responsibility for weed control and prevention be on the holder until the right-of-way is abandoned and successfully rehabilitated. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a negligible effect in comparison to Alternatives B, C, and D.

Minerals: This alternative would have the highest potential impact on noxious weeds from activities associated with leasable/fluid mineral development because surface use stipulations are less restrictive under Alternative A when compared to the other alternatives. Under Alternative A, the approximate number of acres that would be closed to leasable/fluid mineral leasing is 6,894 acres. The number of acres that would be open and subject to NSO lease stipulations is 15,489 acres; and the number of acres subject to CSU restrictions is 2,954 acres (Table 4-30). The number of wells is projected at 163 and the approximate number of disturbed acres associated with well sites, access roads and pipelines is projected at 642 acres. The same number of wells is anticipated under all alternatives. Impacts to noxious weeds from leasable mineral development are anticipated to be similar in nature and have a negligible effect in comparison to the other alternatives. Under Alternatives A, B, C, and D, the potential surface disturbance resulting from salable mineral development such as sand and gravel, and from locatable minerals, primarily bentonite which is anticipated at 225 acres, are the same. It is anticipated that the impacts would be similar in nature and have a negligible effect for all alternatives.

Renewable Energy: The types of impacts to noxious weeds resulting from renewable energy development would be the same as described under Impacts Common to All Alternatives. Construction of renewable energy roads and facilities would have the greatest impacts under all alternatives. Alternative A has the highest potential impact on noxious weeds with 924 acres of short-term surface disturbance and 231 acres long-term surface disturbance from renewable energy development.

Impacts under Alternative B

Soil Resources: Alternative B has a higher potential for an increase in noxious weeds than Alternative C, as this alternative allows for the utilization of road and trail restrictions on routes not necessary for management when soil health would be adversely impacted, whereas as Alternative C would close roads and trails not necessary for management when soil health would be negatively or adversely impacted, and reclaim to native vegetation. Under Alternative B, roads may be closed if necessary, but has an exception whereby the authorized officer can forego or lift restrictions or allow roads to remain open if it is determined that soil health and associated resources are not being harmed. This exception is not included in Alternative C.

Alternative B is similar to Alternative D, with the exception in Alternative D being slightly less restrictive than in Alternative B, and with no modification in Alternative B, Alternative D is again slightly less restrictive. There is no related management action in Alternative A; therefore, no comparison was made. It is anticipated that impacts would be similar in nature and have a negligible effect when compared to Alternatives A, C, and D. For additional impacts, see text above under Impacts Common to All Alternatives.

Wildlife

Bighorn Sheep: Alternative B has a lower potential for an increase of noxious weeds than Alternatives C and D, as the potential number of acres that could be treated using domestic sheep and goats is higher. This alternative would allow the use of domestic sheep and goats for weed control within 5 miles of bighorn sheep range versus 10 miles in Alternatives C and D. There is no related management action in Alternative A; therefore, no comparison was made. It is anticipated that impacts would be similar in nature and have a negligible effect when compared to Alternatives A, C, and D.

Raptors: Alternative B, which is the same as Alternative D, would have the lowest potential impact on noxious weeds or invasive species as the 1/4 mile weed treatment restriction zone from March 1 – August 1 applies only to current year active raptor nesting sites versus raptor nesting sites active over the previous two years in Alternative C. There is no related management action in Alternative A; therefore, no comparison was made. It is anticipated that impacts would be similar in nature and have a negligible effect when compared to Alternatives A, C, and D.

Special Status Species

Raptors: In Alternative B, no weed treatments would occur within a 1/4 mile buffer zone around active special status species raptor nesting sites from March 1 to August 1. Under an exception, weed treatment may be possible within the 1/4 mile buffer zone from March 1 to August 1 following consultation with necessary specialists for timing of least impacts. The impacts from this alternative would be similar and negligible in comparison to Alternatives C and D because of the exception found in Alternatives B, C, and D.

With this exception, weed treatments may be possible within the 1/4 mile buffer zone from March 1 to August 1, following consultation with the necessary specialists for timing of least impacts. This would allow treatments whether or not a nest site has been active over the previous seven years. Alternative A would be less restrictive and have the lowest potential impact on noxious weeds and invasive species as there is no defined management action, therefore, no defined restrictions or limitations on weed treatments or timing of applications that would apply.

Greater Sage-Grouse: Alternative B is less restrictive than Alternative A, which would not allow weed treatments within a 2 mile buffer zone. Although Alternative B has a less restrictive treatment buffer zone than Alternative C, and is the same as Alternative D – 3 miles/4 miles/4 miles, these three alternative are the same, as they all allow for weed spot treatments only, using IPM methods within suitable nesting or brood-rearing habitat within those buffer zones of known sage-grouse leks from March 1 through June 30. It is anticipated that sage-grouse would have a negligible impact on noxious weeds and invasive species.

Greater Sage-Grouse PPAs: Alternative B has a higher potential for an impact on noxious weeds because spot weed treatments within suitable nesting or brood-rearing habitat of known sage-grouse leks would occur in PPAs only (7,233 acres) versus Alternative A which would not allow treatments within a two mile buffer (47,857 acres) of suitable nesting habitat of sage-grouse leks, and Alternatives C (13,548 acres) and D (7,233 acres) which allow spot weed treatments within suitable nesting or brood-rearing habitat of known sage-grouse leks.

Prairie Dogs: Alternative B would have a higher potential impact on noxious weeds than Alternative A, as Alternative A states that prairie dogs which are not causing significant adverse impacts to soil and vegetative resources would be managed for their wildlife and recreational values, whereas in Alternative B, treatment would be considered if prairie dogs are causing adverse impacts to soil and vegetative resources, or other resources and/or threats to public health and safety.

Treatment of any prairie dog colony that exists on both public and private land would be considered through project level planning when the adjoining landowner is controlling the prairie dogs on their land. Alternatives C and D have the same treatment language as Alternative B.

Alternative B is also more restrictive than Alternative A in the number of acres of prairie dog colonies that can be treated annually, 15 percent or approximately 296 acres, as no management action in Alternative A establishes the number of acres that could be treated, but it is assumed it would be less than 10 percent, or under 198 acres based on past treatment history; and Alternative C, which limits the number of acres of prairie dog colonies that can be treated annually to 10 percent or approximately 198 acres. Alternative D is the same as Alternative B with 15 percent or approximately 296 acres that can be treated annually. It is anticipated that impacts to noxious weeds and invasive species from prairie dogs would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, C, and D.

Fire Management and Ecology: Alternative B would have the highest potential impact on noxious weeds and invasive plant species based on the number of acres disturbed when compared to Alternative A (1400 acres – 1000 acres/prescribed fire and 400 acres mechanical) versus (569 acre - 213 acres/prescribed fire and 246 acres mechanical); and Alternative C, (1400 acres – 1000 acres/prescribed fire and 400 acres mechanical) versus (850 acres – 500 acres/prescribed fire and 350 acres mechanical); and is the same as Alternative D (1400 acres – 1000 acres/prescribed fire and 400 acres mechanical).

Conversely, Alternative B would have the lowest potential impact from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, compared to Alternatives A and C because of the higher number of acres being treated, and would be the same as Alternative D because the same number of acres would be treated.

Impacts from the use and movement of heavy equipment for fire suppression would be allowed in all areas unless otherwise restricted, and would be the same for Alternatives C and D.

Alternative B differs slightly and is somewhat less restrictive than Alternative A, which states that the use of heavy equipment would be avoided for wildfire suppression in areas with special designations to protect cultural resources and values and other areas known to possess cultural resources. The use of heavy equipment and off-road vehicles would be limited to existing roads and trails within these areas during rehabilitation. The use of heavy equipment would be restricted in riparian areas, streamside zones, Belle Eldridge repository, or other hazardous and environmentally sensitive sites and identified cultural properties. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, C, and D.

Forest and Woodland Products: Alternative B would have the highest potential impact on noxious weeds and invasive plant species based on the number of acres disturbed when compared to Alternatives A and C and is the same as Alternative D. Under Alternative B, new permanent roads may be built for long-term management of areas where multiple entries would be necessary to meet objectives and rerouting and maintenance of existing authorized roads would be allowed to reduce impacts to resources. In addition, temporary road construction would be allowed, kept to a minimum and decommissioned as part of the project. Alternative A does not specify whether roads that would be constructed for forest product removal would be new permanent roads or temporary roads, nor does it provide a management action for rerouting and maintenance of existing roads.

Alternative C would not allow construction of new permanent roads for forest management. Alternatives B has a PSQ estimated at 7000 tons/year and is the same for Alternatives A and D, which would suggest that the number of acres disturbed by sales would be similar in comparison. Alternative C is estimated at 6000 tons/year, which would suggest that the number of acres disturbed by sales would be less. Conversely, this alternative would have a slightly less potential impact than Alternative C from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, because of the higher number of tons of product that would be removed under PSQ, and has the same potential impact as Alternatives A and D. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives B, C, and D.

Livestock Grazing: See Impacts under Alternative A, Livestock Grazing, paragraph one, which is the same for all alternatives, for the total number of administered surface acres available for grazing and Alternative A paragraphs two and three which are the same for all alternatives for range improvement projects.

Grazing would be allowed throughout the Exemption Area for beneficial resource uses such as fuel treatments, weed control, etc. Grazing would be implemented on a treatment basis and would be completed following a site-specific interdisciplinary team analysis and not set up as an allotment.

It is anticipated that impacts to noxious weeds and invasive species from livestock grazing would be similar in nature and are negligible in comparison to Alternatives A, C, and D.

Recreation: Alternative B has a higher potential impact on noxious weeds than Alternatives A and C, but similar to Alternative D. Under Alternative B, approximately 11,652 acres (Fort Meade ACEC – 6,574 acres and the Exemption Areas – 5,078 acres) would be designated SRMAs versus no designation in Alternative A; 6,733 acres in Alternative C; and the same 11,652 acres in Alternative D. The designation of SRMAs would indicate a commitment to intensive recreation management, which in turn could lead to an increased potential for the introduction and spread of noxious weeds and invasive species.

Motorized cross-country travel would be limited to 300 feet from the nearest road to retrieve downed big game animals and would be prohibited in Alternatives A, C, and D. Alternative B allows for motorized cross-country travel for camping purposes but would be limited to within 300 feet of existing roads and trails after locating the campsite in a non-motorized fashion, which is the same as Alternative A but is limited to 100 feet in Alternatives C and D.

Alternatives B and D, by allowing the development of new roads, increase the potential for the introduction and spread of noxious weeds. New roads and trails would not be developed in Alternative C and Alternative A has no language/management action for the development of new roads or trails.

The Recreation Opportunity Spectrum (ROS) for semi-primitive motorized, which favors motorized vehicle recreation, is the highest (259,623 acres) in Alternative B, creating a high potential for the introduction and spread of noxious weeds by vehicle traffic. Impacts to noxious weeds and invasive species from recreation actions are anticipated to be similar in nature and have a minor adverse short-term effect in comparison to all alternatives.

Travel Management and OHV: This alternative has a greater potential for the introduction and spread of noxious weeds than Alternative A, but less than Alternative C as it allows for the construction of new roads, with new construction kept to the minimum necessary for multiple use management. Rerouting and maintenance of existing authorized roads would be allowed, as would temporary road construction. Temporary roads would be decommissioned as the project is completed. The planning area would be managed for 259,936 acres of Semi-primitive Motorized Recreation Opportunity Class and 11,817 acres of Roaded Natural Recreation Opportunity Class. Under Alternative B, motorized cross-country travel would be limited to 300 feet from the nearest road to retrieve downed big game animals and to access a campsite by direct route unless prevented by terrain features. Impacts to noxious weeds and invasive species are anticipated to be similar in nature and have a minor adverse short-term effect in comparison to all alternatives.

Lands and Realty: Any new acquisition of lands or easements would need to be inventoried for invasive species to determine the impact and cost of management of that parcel. Any disposal lands would have to be inventoried for the presence of noxious weeds in order to disclose this information according to BLM policy. Invasive species effects on rights-of-way would be mitigated by stipulating that the responsibility for weed control and prevention be on the holder until the right-of-way is abandoned and successfully rehabilitated. Impacts to noxious weeds and invasive species from Lands and Realty actions are anticipated to be similar in nature and negligible in comparison for all alternatives.

Minerals: Alternative B would have a higher potential impact on noxious weeds than Alternatives C and D, but less than Alternative A, based on soil disturbing activities associated with leasable/fluid mineral development because of the number of acres closed to leasing and the number of acres subject to NSO and CSU when compared to the other alternatives. Under Alternative B, the approximate number of acres that would be closed to leasable/fluid mineral leasing is 6,574 acres. The number of acres that would be open to lease terms is 59,416 acres, and the number of acres subject to NSO is 105,837 acres; the number of acres subject to CSU is 10,561 acres as shown in Table 4-30.

The number of wells is projected at 163 and the approximate number of disturbed acres associated with well sites, access roads and pipelines is projected at 642 acres. The same number wells are anticipated under all alternatives.

A similar number of wells and associated infrastructures would likely be constructed as under Alternative A; however, more CSU stipulation would apply to fluid-mineral leases resulting in greater protection to soil resources resulting in less soil disturbance and therefore lower levels of impact on noxious weeds compared to Alternative A.

Under Alternatives A, B, C, and D, the potential for impacts from surface disturbance resulting from salable mineral development such as sand, gravel; and for surface disturbance from locatable minerals, primarily bentonite, which is anticipated at 225 acres, are the same. It is anticipated that the impacts would be similar in nature and have a negligible effect for all alternatives.

Renewable Energy: The types of impacts to noxious weeds resulting from renewable energy development would be the same as described under Impacts Common to All Alternatives. Construction of renewable energy roads and facilities would have the greatest impacts under all alternatives. Alternative B would result in 768 acres disturbed in the short term and 192 acres in the long term (less than alternative A but more than Alternatives B and D). Alternative B would have a lower potential impact on noxious weeds compared to Alternative A.

Impacts under Alternative C

Soil Resources: Alternative C would have the lowest impact potential to noxious weeds compared to Alternatives C and D, as roads and trail not necessary for management when soil health would be negatively or adversely impacted would

be closed and reclaimed to native vegetation in this alternative. Alternative B states roads may be closed, however there is an Exception: The authorized officer can forego or lift restrictions or allow roads to remain open if it is determined that soil health and associated resources are not being harmed. Alternative D states roads may be closed, however there is an Exception: The authorized officer can allow continued use on some short stretches or roads and trails that would normally be closed if they allow access to other users and for the public. Alternative D also has a Modification: Roads and trails would be rerouted around problem locations to prevent soil health concerns. There is no related management action in Alternative A therefore no comparison was made. It is anticipate impacts would be similar in nature and have a negligible effect when compared to Alternatives A, B, and D. For additional impacts, see text above under Soils, Impacts Common to All Alternatives.

Wildlife

Bighorn Sheep: Alternative C has a higher potential for an increase of noxious weeds than Alternative B and is the same as Alternative D, as the potential number of acres that could be treated using domestic sheep and goats is higher. This alternative would allow the use of domestic sheep and goats for weed control within 10 miles of bighorn sheep range versus 5 miles in Alternatives C and 10 miles in Alternative D. There is no related management action in Alternative A therefore no comparison was made. It is anticipate impacts would be similar in nature and have a negligible effect when compared to Alternatives A, B, and D.

Raptors: Alternative C has the highest potential for/the greatest impact on noxious weeds or invasive species as the 1/4 mile weed treatment restriction zone from March 1 – August 1 applies to raptor nesting sites active over the previous seven years, versus current year nesting sites in Alternatives B and D. There is no related management action in Alternative A therefore no comparison was made. It is anticipate impacts would be similar in nature and have a negligible effect when compared to Alternatives A, B, and D.

Special Status Species

Raptors: Alternative C would have the higher potential impact on noxious weeds because of the 1/4 mile buffer zone around special status species nesting sites active over the previous seven years restriction versus current active nesting sites restriction in Alternative B and D. Although Alternative C has a more restrictive treatment buffer zone than Alternatives B and D, because of the Exception found in all three alternatives, (Exception: weed treatment may be possible within the 1/4 mile buffer zone from March 1 – August 1, following consultation with necessary specialists for timing of least impacts.), Alternatives B, C, and D, would be considered as one alternative from a weed treatment perspective. There is no related management action in Alternative A, therefore no comparison was made. It is anticipate impacts would be similar in nature and have a negligible effect when compared to Alternatives A, B, and D.

Greater Sage-Grouse: Alternative C is less restrictive than Alternative A, which would not allow weed treatments with a 2 mile buffer zone. Although Alternative C has a more restrictive treatment buffer zone than Alternatives B and D, – 4 miles/3 miles/3 miles, respectively – these three alternatives are the same, as they all allow for weed spot treatments only, using IPM methods within suitable nesting or brood-rearing habitat, within those buffer zones of known sage-grouse leks from March 1-June 30. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a negligible effect in comparison to Alternatives A, B, and D.

Greater Sage-Grouse PPAs: Alternative C would have a low potential for an impact on noxious weeds by allowing spot weed treatments within suitable nesting or brood-rearing habitat (13,548 acres) of known leks from March 1 – June 30, compared to the lowest potential impact on noxious weeds in Alternative D at 7,233 acres; Alternative A which would allow no weed treatments within a two mile buffer zone (47,857 acres) within suitable nesting habitat of known sage-grouse leks from March 1 – June 30; and compared to Alternative B, which allows spot weed treatments within suitable nesting or brood-rearing habitat of Greater Sage-Grouse PPAs only (7,233 acres) from March 1 – June 30. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a negligible effect in comparison to Alternatives A, B, and D.

Prairie Dogs: Alternative C would have a higher potential impact on noxious weeds than Alternative A, as Alternative A states that prairie dogs that are not causing significant adverse impacts to soil and vegetative resources would be managed for their wildlife and recreational values, whereas in Alternative B, treatment would be considered if prairie dogs are causing adverse impacts to soil and vegetative resources, or other resources and/or threats to public

health and safety. Treatment of any prairie dog colony that exists on both public and private land would be considered through project level planning when the adjoining landowner is controlling the prairie dogs on their land. Alternatives C and D have the same treatment language as Alternative B. Alternative C, is also more restrictive in the number of acres of prairie dogs that can be treated annually compared to Alternatives B and D, with the number of acres of prairie dogs that can be treated annually limited to 10 percent or approximately 198 acres, whereas Alternatives B and D limit the number of acres of prairie dogs that can be treated annually to 15 percent or approximately 296 acres.

Alternative A does not specify the number of acres that can be treated annually, but it is assumed it would be less than 10 percent - under 198 acres based on past treatment history. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and D.

Fire Management and Ecology: Alternative C would have a higher potential impact on noxious weeds and invasive plant species based on the number of acres disturbed when compared to Alternatives A, (1400 acres – 1000 acres/prescribed fire and 400 acres mechanical) versus (569 acre - 213 acres/prescribed fire and 246 acres mechanical); and less potential impact than Alternatives B and D with 1400 acres – 1000 acres/prescribed fire and 400 acres mechanical in each alternative versus 569 acre - 213 acres/prescribed fire and 246 acres mechanical in this alternative. Conversely, this alternative would have a slightly less potential impact than Alternative A from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, because of the slightly higher number of acres 850 versus 559 being treated; and a higher impact potential than Alternatives B and D because of the lower number of acres 850 versus 1400 being treated.

Impacts from the use and movement of heavy equipment for fire suppression would be allowed in all areas unless otherwise restricted, is the same for Alternatives B and D and differ slightly and are somewhat less restrictive than

Alternative A which states that the use of heavy equipment would be avoided for wildfire suppression in areas with special designations to protect cultural resources and values and other areas known to possess cultural resources. The use of heavy equipment and off-road vehicles would be limited to existing roads and tails within these areas during rehabilitation. The use of heavy equipment would be restricted in riparian areas, streamside zones, Belle Eldridge repository, or other hazardous and environmentally sensitive sites and identified cultural properties.

It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and D.

Forest and Woodland Products: Alternative C would have the lowest potential impact on noxious weeds and invasive plant species based on the number of acres disturbed when compared to Alternatives A, B, and D. Alternative C would not allow the construction of new permanent roads or rerouting of existing roads, whereas Alternative A does not specify whether roads that would be constructed for forest product removal would be new permanent roads or temporary roads, nor a management action for rerouting and maintenance of existing roads. Alternatives B and D allow new permanent roads construction, temporary road construction, and rerouting and maintenance of existing roads.

The PSQ for Alternative C is estimated at 6000 tons/year which is less than Alternatives A, B, and D, which are estimated at 7000 tons/year each, indicating less acres disturbed/lower potential impact on noxious weeds. Conversely, this alternative would have a slightly higher potential impact than Alternatives A, B, and D from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, because of the lower number of tons of product that would be removed under PSQ. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and D.

Livestock Grazing: Reference Alternative A for the total number of administered surface acres available for grazing and range improvement projects, and Alternative B for grazing in the Exemption Area. Alternative C would be the same as Alternative B.

It is anticipated that impacts to noxious weeds and invasive species from livestock grazing would be similar in nature and are negligible in comparison to Alternatives A, B, and D.

Recreation: Alternative C has lower potential impact than Alternatives B and D based on SRMA designation - 6,574 acres versus 11,652 in Alternatives B and D, but higher than alternative A which has no SRMA designation; and ROS

identification - 102,764 semi-primitive motorized acres versus 259,623 semi-primitive motorized acres in Alternatives B and D, but higher than Alternative A, in which ROS has not be identified. The designation of SRMAs would indicate a commitment to intensive recreation management, which could in turn lead to an increased potential for the introduction and spread of noxious weeds and invasive species. The ROS for semi-primitive motorized, which favors motorized vehicle recreation, is the lowest in Alternative C, and therefore the lowest potential for the introduction and spread of noxious weeds by vehicle traffic.

The development of new roads and trails would not be allowed in Alternative C, but are in Alternatives B and D, creating a higher potential for the introduction and spread of noxious weeds through ground disturbance. There is no management action identified, therefore no comparison was made between Alternatives C and A.

Other management action that are identified in Alternative C such as limiting motorized cross-country travel for camping purposes to within 100 feet of existing roads is the same as Alternative D and less than Alternatives A and B which limits travel for camping purposes to within 300 feet of existing roads and prohibiting cross-country travel to retrieve downed big game animals in this and Alternatives A and D, and to within 300 feet of existing roads in Alternative B; are similar enough in comparison that these actions were not considered in predicting potential impacts to noxious weeds from recreation. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a negligible effect in comparison to Alternatives A, B, and D.

Travel Management and OHV: This alternative has the least potential for the introduction and spread of invasives/noxious weeds as no new roads would be constructed except as required by law, regulation or policy. Maintenance of existing roads would be allowed, however rerouting of existing roads would not be allowed. Temporary roads could be constructed, with construction kept to a minimum (construction standard, number, and length) and would be decommissioned at the end of the project. Motorized wheeled cross-country travel to retrieve downed big game animals is prohibited. Travel would be allowed within 100 feet or roads to access campsite by direct route unless prevented by terrain features.

It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a negligible effect in comparison to Alternatives A, B, and D.

Lands and Realty: Any new acquisition of lands or easements would need to be inventoried for invasive species to determine the impact and cost of management of that parcel. Any disposal lands would have to be inventoried for the presence of noxious weeds in order to disclose this information according to BLM policy. Invasive species effects on rights-of-way would be mitigated by stipulating that the responsibility for weed control and prevention be on the holder until the right-of-way is abandoned and successfully rehabilitated. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a negligible effect in comparison to Alternatives A, B, and D.

Minerals: Alternative C would have a higher potential impact on noxious weeds than Alternative D, but less than Alternatives A and B, based on soil-disturbing activities associated with leasable/fluid mineral development because of the number of acres closed to leasing and the number of acres subject to NSO and CSU when compared to the other alternatives. Under Alternative C, approximately 100,160 acres would be closed to leasable/fluid mineral leasing. The number of acres that would be open with lease terms is 52,146; subject to NSO is 43,897 acres; and the number of acres subject to CSU is 1,535 acres (Table 4-30). The number of wells is projected at 163 and the approximate number of disturbed acres associated with well sites, access roads and pipelines is projected at 642 acres. The same number wells are anticipated under all alternatives.

Under Alternatives A, B, C, and D, the potential from surface disturbance resulting from salable mineral development such as sand and gravel; and from locatable minerals, primarily bentonite, which is anticipated at 225 acres, is the same. It is anticipated that the impacts would be similar in nature and have a negligible effect for all alternatives.

Renewable Energy: The types of impacts to noxious weeds resulting from renewable energy development would be the same as described under Impacts Common to All Alternatives. Construction of renewable energy roads and facilities would have the greatest impacts under all alternatives. Alternative C has the lowest potential impact on noxious weeds with 588 acres of short-term and 78 acres of long-term surface disturbance anticipated, the lowest level of either type of disturbance in any alternative.

Impacts under Alternative D (Preferred Alternative)

Soil Resources: Alternative D would have the highest impact potential to noxious weeds compared to Alternatives C and B, as this alternative allows for the utilization of road and trail restrictions on routes not necessary for management when soil health would be adversely impacted, whereas as Alternative C would close roads and trails not necessary for management when soil health would be negatively or adversely impacted, and reclaimed to native vegetation. Under Alternative B, roads may be closed if necessary, but under an exception the authorized officer can forego or lift restrictions or allow roads to remain open if it is determined that soil health and associated resources are not being harmed. The exception in Alternative D is less restrictive than Alternative C, as the authorized officer can allow continued use on some short stretches of roads and trails that would normally be closed if they allow access to other users and for the public. In addition, Alternative D has the modification by which roads and trail would be rerouted around problem locations to prevent soil health concerns, which by rerouting would create additional ground disturbance. There is no related management action in Alternative A therefore no comparison was made. It is anticipated that impacts would be similar in nature and have a negligible effect when compared to Alternatives A, B, and C. For additional impacts, see the text above under Impacts Common to All Alternatives – Soil Resources.

Wildlife

Bighorn Sheep: Alternative D has a higher potential than Alternative B for an increase in noxious weeds, and the same as Alternative C, as the potential number of acres that could be treated using domestic sheep and goats is lower.

This alternative would allow the use of domestic sheep and goats for weed control within 10 miles of bighorn sheep range versus 5 miles in Alternative B and 10 miles in Alternative C. There is no related management action in Alternative A, therefore no comparison was made. It is anticipated impacts would be similar in nature and have a negligible effect when compared to Alternatives A, B, and C.

Raptors: Alternative D, which is the same as Alternative B, would have the lowest potential for/the least impact on noxious weeds or invasive species as the 1/4 mile weed treatment restriction zone from March 1 to August 1 applies only to current year active raptor nesting sites versus raptor nesting sites active over the previous seven years in Alternative C. There is no related management action in Alternative A, therefore no comparison was made. It is anticipated impacts would be similar in nature and have a negligible effect when compared to Alternatives B and C.

Special Status Species

Raptors: Alternative D, which is the same as Alternative B, would have the lowest potential impact on noxious weeds because of the 1/4 mile buffer zone around current active special status species raptor nesting sites versus the active over the previous seven years restriction in Alternative C. Alternatives B, C, and D all have the exception that weed treatment may be possible within the 1/4 mile buffer zone from March 1 to August 1, following consultation with necessary specialists for timing of least impacts. Alternatives B, C, and D would be considered as one alternative from a weed treatment perspective. There is no related management action in Alternative A, therefore no comparison was made. It is anticipated impacts would be similar in nature and have a negligible effect when compared to Alternatives A, B, and C.

Greater Sage-Grouse: Alternative D is less restrictive than Alternative A, which would not allow weed treatments within a 2 mile buffer zone. Although Alternative D has a less restrictive treatment buffer zone than Alternative C, and is the same as Alternative B; 3 miles/4 miles/3 miles respectively. These three alternatives are the same as they all allow for weed spot treatments only, using IPM methods within suitable nesting or brood-rearing habitat, within those buffer zones of known sage-grouse leks from March 1 through June 30. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Greater Sage-Grouse PPAs: Alternative D would have the lowest potential for an impact on noxious weeds by allowing spot weed treatments within suitable nesting or brood-rearing habitat (7,233 acres) of known leks from March 1 through June 30, compared to Alternative C at 13,548 acres. Alternative A, which would allow no weed treatments within a 2 mile buffer zone (47,857 acres) within suitable nesting habitat of known sage-grouse leks from March 1 through June 30; and compared to Alternative B, which would allow spot weed treatments within suitable nesting or brood-rearing habitat of

Greater Sage-Grouse PPAs only (7,233 acres) from March 1 through June 30. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Prairie Dogs: Alternative D would have a higher potential impact on noxious weeds than Alternative A, as Alternative A states that prairie dogs that are not causing significant adverse impacts to soil and vegetative resources would be managed for their wildlife and recreational values, whereas in Alternative D, treatment would be considered if prairie dogs are causing adverse impacts to soil and vegetative resources, or other resources and/or are threats to public health and safety. Alternatives B and C have the same treatment language as Alternative D. Alternative D is also more restrictive than Alternative A in the number of acres of prairie dog colonies that can be treated annually is 15 percent or approximately 296 acres, as there is no management action in Alternative A that establishes the number of acres that could be treated, assuming that less than 5 percent would be treated annually, and Alternative C, which limits the number of acres of prairie dogs that can be treated annually to 10 percent or approximately 198 acres.

Alternative D is the same as Alternative B with 15 percent or approximately 296 acres that can be treated annually. It is anticipated that impacts to noxious weeds and invasive species from prairie dogs would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Fire Management and Ecology: Alternative D would have the highest potential impact on noxious weeds and invasive plant species based on the number of acres disturbed when compared to Alternatives A (1400 acres – 1000 acres/prescribed fire and 400 acres mechanical) versus (569 acre - 213 acres/prescribed fire and 246 acres mechanical); and Alternative C (1400 acres – 1000 acres/prescribed fire and 400 acres mechanical) versus (850 acres – 500 acres/prescribed fire and 350 acres mechanical); and is the same as Alternative B (1400 acres – 1000 acres/prescribed fire and 400 acres mechanical). Conversely, Alternative D would have the lowest potential impact on forest health from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, compared to Alternatives A and C, because of the higher number of acres being treated; and would be the same as Alternative B because the same number of acres would be treated. Impacts from the use and movement of heavy equipment for fire suppression would be allowed in all areas unless otherwise restricted, is the same for Alternatives C and D and differ slightly and are somewhat less restrictive than Alternative A which states that the use of heavy equipment would be avoided for wildfire suppression in areas with special designations to protect cultural resources and values and other areas known to possess cultural resources. The use of heavy equipment and off-road vehicles would be limited to existing roads and trails within these areas during rehabilitation. The use of heavy equipment would be restricted in riparian areas, streamside zones, Belle Eldridge repository, or other hazardous and environmentally sensitive sites and identified cultural properties.

It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Forest and Woodland Products: Alternative D would have the highest potential impact on noxious weeds and invasive plant species based on the number of acres disturbed when compared to Alternatives A and C and is the same as Alternative B. Under Alternative D, new permanent roads may be built for long-term management of areas where multiple entries would be necessary to meet objectives, and rerouting and maintenance of existing authorized roads would be allowed to reduce impacts to resources. In addition, temporary road construction would be allowed, kept to a minimum and decommissioned as part of the project. Alternative A does not specify whether roads that would be constructed for forest product removal would be new permanent roads or temporary roads, nor does it provide a management action for rerouting and maintenance of existing roads. Alternative C would not allow construction of new permanent roads for forest management. Alternative D has a PSQ estimated at 7,000 tons/year and is the same for Alternatives A and B, which would suggest that the number of acres disturbed by sales would be similar in comparison. Alternative C is estimated at 6,000 tons/year for Alternative C, which would suggest that the number of acres disturbed by sales would be less. Conversely, this alternative would have slightly less potential impact than Alternative C from locally declared pests such as the Mountain Pine Beetle and Ips Bark Beetle, because of the higher number of tons of product removed under PSQ, and has the same potential impact as Alternatives A and B.

It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Livestock Grazing: See Impacts under Alternative A for the total number of administered surface acres available for grazing and range improvement projects, and Alternative B for grazing in the Exemption Area. Alternative D is the same as Alternatives B and C.

It is anticipated that impacts to noxious weeds and invasive species from livestock grazing would be similar in nature and are negligible in comparison to Alternatives A, B, and C.

Recreation: Alternative D has a higher impact potential on noxious weeds than Alternatives A and C, but similar to Alternative B. Under Alternative D, approximately 11,652 acres (Fort Meade ACEC – 6,574 acres and the Exemption Areas – 5,078 acres) would be designated SRMAs versus no designation in Alternative A; 6,733 acres in Alternative C; and the same 11,652 acres in Alternative B. The designation of SRMAs would indicate a commitment to intensive recreation management, which in turn could lead to an increased potential for the introduction and spread of noxious weeds and invasive species.

Motorized cross-country travel would be limited to 300 feet from the nearest road to retrieve downed big game animals and would be prohibited in Alternatives A, C, and D. Alternative B allows for motorized cross-country travel for camping purposes but would be limited to within 300 feet of existing roads and trails after locating the campsite in a non-motorized fashion, which is the same as Alternative A but is limited to 100 feet in Alternatives C and D. Alternatives B and D, by allowing the development of new roads, would increase the potential for the introduction and spread of noxious weeds. New roads and trails would not be developed in Alternative C and there is no language/management action in Alternative A for the development of new roads or trails. The ROS for semi-primitive motorized, which favors motorized vehicle recreation, is the highest (259,623 acres) in Alternative B, and is the same for Alternative D, creating the highest potential for the introduction and spread of noxious weeds by vehicle traffic. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Travel Management and Transportation: This alternative has a greater potential for the introduction and spread of noxious weeds than Alternatives A and C and is the same as Alternative B, as it allows for the construction of new roads, with new construction kept to the minimum necessary for multiple use management. Rerouting and maintenance of existing authorized roads would be allowed as would temporary road construction. Temporary roads would be decommissioned as the project is completed. In Alternative A, roads would be constructed to the minimum standard necessary, unless the roads would be needed for other purposes requiring a higher standard, and there is no language or management action that identifies the type of road to be constructed (new-permanent or temporary) nor allowances for rerouting of roads. Alternative C does allow for the construction of temporary roads which would be decommissioned as part of the project, but does not allow for the construction of new permanent roads or the rerouting of existing roads. Under Alternative D, motorized cross-country travel would be prohibited to retrieve downed big game animals, which is the same in Alternatives A and C. Alternative D would allow cross-country travel within 100 feet to access campsite by direct route unless prevented by terrain features, which is the same as Alternative C but more restrictive than Alternatives A and B which allow travel within 300 feet to access campsites. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Lands and Realty: Any new acquisition of lands or easements would need to be inventoried for invasive species to determine the impact and cost of management of that parcel. Any disposal lands would have to be inventoried for the presence of noxious weeds in order to disclose this information according to BLM policy. Invasive species effects on rights-of-way would be mitigated by stipulating that the responsibility for weed control and prevention be on the holder until the right-of-way is abandoned and successfully rehabilitated. It is anticipated that impacts to noxious weeds and invasive species would be similar in nature and have a minor adverse short-term effect in comparison to Alternatives A, B, and C.

Minerals: Alternative D would have the least potential impact on noxious weeds compared to Alternatives A, B, and C based on soil-disturbing activities associated with leasable/fluid mineral development because of the number of acres closed to leasing and has the highest number of acres subject to NSO and CSU. Under Alternative D, the approximate number of acres that would be closed to leasable/fluid mineral leasing is 6,894 acres. The number of acres that would be open with lease terms is 52,803 acres and subject to NSO is 107,025 acres; and the number of acres subject to CSU is 10,031 acres (Table 4-30). The number of wells is projected at 163 and the approximate number of disturbed acres associated with well sites, access roads and pipelines is projected at 642 acres. The same number of wells are anticipated under all alternatives.

Under Alternatives A, B, C, and D, the potential for impacts from surface disturbance resulting from salable mineral development such as sand and gravel, and from locatable minerals, primarily bentonite, which is anticipated at 225 acres, are the same. It is anticipated that the impacts would be similar in nature and have a negligible effect for all alternatives.

Renewable Energy: The types of impacts to noxious weeds resulting from renewable energy development would be the same as described under Impacts Common to All Alternatives. Construction of renewable energy roads and facilities would have the greatest impacts under all alternatives. Alternative D would result in 520 acres disturbed in the short term and 130 acres disturbed in the long term as a result of renewable energy development. Impacts would be much lower than Alternative A, but higher than Alternatives B and D.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present actions that affect and have affected noxious weeds and other invasive species include mineral and energy exploration and development, Lands and Realty surface-disturbing rights-of-way, overutilization of vegetation by wildlife and livestock, recreational uses including OHVs and non-motorized recreation, and vegetation treatments including those for fire management and forest health. In general, these actions have all had cumulatively adverse impacts on other resources due to the introduction of invasive species by causing surface disturbance. It is reasonably foreseeable that these actions will continue to occur and could continue to affect the invasive species populations in the areas. However, mitigations designed and implemented for each of these activities should minimize these effects.

Beneficial impacts include those vegetation treatments that improve vegetative cover, diversity, and production in the long term. Reasonably foreseeable future actions in the planning area and on federal, state, private, and other lands within and adjacent to the planning area that could adversely impact noxious weeds and invasive species include: ongoing mineral exploration, development and production, renewable energy development, livestock grazing that does not follow Guidelines for Livestock Grazing Management (Appendix A), and vegetation treatments for fire management and forest health.

Cumulative impacts as a result of reasonably foreseeable action on other federal, state, private, and other lands are difficult to predict or measure. The use of herbicides on BLM lands in the planning area since 2000 has been relatively consistent. This can be said generally about each county weed board's activities. There is no reasonable way to determine the use of herbicides by private individuals. Little information is available to determine the cumulative impact of repeated applications of herbicides across the planning area other than factors that are already monitored for rangeland and riparian health. Mitigation measures, conservation measures, and standard operating procedures applied from the Vegetation Treatment Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS and ROD (BLM 2007c) and the pesticide labels are designed to mitigate and avoid these perceived impacts. Foreseeable future use of herbicides should remain consistent unless resources and priorities change above the scope of this analysis. Vegetation treatments of noxious weeds and invasive plant species would cause short-term impacts on vegetation by decreasing vegetation production and increasing establishment of early successional species. However, long-term effects would include increased production and diversity of vegetative communities.

Cumulative Impacts under Alternative A (Current Management)

Alternative A would result in slightly more surface disturbance than Alternatives B, C and D. This alternative would result in a higher impact on the spread of noxious weeds and invasive species. While the cumulative impact would be the highest, the increase in the spread of weeds and invasive species would not be large enough to be predictable or measurable.

Cumulative Impacts under Alternative B

Because the established protection measures for soil, water, vegetation, and wildlife resources are somewhat less restrictive, and resource uses such as recreation, transportation, forest and woodland products, and wildland fire ecology and management are also less restrictive, allowing for increased surface disturbance in comparison to Alternative C, the total cumulative impacts to noxious weeds and other invasive species would be the highest under this alternative. Many of the protective measures for resources and resource uses found in Alternative B were carried forward into Alternative D,

therefore, making Alternatives B and D the same for comparison purposes of total cumulative impacts to noxious weeds and invasive species.

Cumulative Impacts under Alternative C

Because the established protection measures for soil, water, vegetation, and wildlife resources are somewhat more restrictive, and resource uses such as recreation, transportation, forest and woodland products, and wildland fire ecology and management are also more restrictive, allowing for less surface disturbance in comparison to Alternatives B and D, the total cumulative impacts to noxious weeds and other invasive species would be the lowest under this alternative. Alternative C would result in fewer impacts compared to Alternative A because of the higher level of restrictions.

Cumulative Impacts under Alternative D (Preferred Alternative)

Because the established protection measures for soil, water, vegetation, and wildlife resources are somewhat less restrictive, and resource uses such as recreation, transportation, forest and woodland products, and wildland fire ecology and management are also less restrictive, allowing for increased surface disturbance in comparison to Alternative C, the total cumulative impacts to noxious weeds and other invasive species would be the highest under this alternative. Many of the protective measures for resources and resource uses found in Alternative D were carried forward from Alternative B, therefore making Alternatives B and D the same for comparison purposes of total cumulative impacts to noxious weeds and invasive species.

Wildlife

The analysis focuses on identifying the types and intensity of impacts to wildlife habitat. Known and potential wildlife species and their habitats within the planning area are described in Chapter 3. Species analyzed as affected by various alternatives and the types of impacts are directly correlated with the location, degree, nature, and quantity of surface-disturbing activities within the planning area. Additionally, impacts and management actions on wildlife may directly or indirectly relate to other resources or resource uses. Therefore, it is recommended that all impact analyses are reviewed to attain a comprehensive description of the impacts on wildlife.

Direct impacts to wildlife may include direct mortalities or displacement of individuals, habitat loss or alteration, habitat fragmentation, impacts to breeding, and animal displacement. Indirect impacts from increased noise and additional human presence also could lead to displacement and lowered fitness. Although the habitat adjacent to the planning area may support some displaced animals, any species that is at or near its carrying capacity could exhibit localized increased mortality. Short-term impacts include changes that occur over a period of five years or less. This would include impacts to species dependent on herbaceous habitats. Long-term impacts would consist of changes to wildlife habitats lasting more than five years and would include species dependent on habitats with woody species components. The severity of both short- and long-term impacts would depend on factors such as the sensitivity of the species impacted, seasonal use patterns, type and timing of construction activities, and physical parameters (e.g., topography, cover, forage, and climate).

Guidelines and Assumptions

To analyze the potential effects of the alternatives on wildlife habitat, information was gathered from existing inventories, management and recovery plans, coordination with the U.S. Fish and Wildlife Service (USFWS), South Dakota Game, Fish and Parks (SDGFP), South Dakota Natural Heritage Program database, relevant scientific literature, geospatial habitat models, and other sources identifying the potential distribution of these species in and adjacent to the planning area. The analysis is also based on the professional expertise of BLM specialists.

The analysis was based on the following assumptions:

At a small scale, higher densities of permanent facilities and roads have been found to increase the adverse impacts to wildlife although investigations on landscape level effects have only been completed on a few species (Hebblewhite 2008).

For many wildlife species disturbances are related to timing of the impacts. Disturbance during sensitive periods adversely impacts wildlife. Big game are more vulnerable during the winter although disturbances located outside winter range areas during the growing season can affect the physiological condition and subsequent winter survival of individuals. Raptors are more vulnerable to disturbances during the early stages of nesting.

The BLM is responsible for managing habitats, whereas state and federal wildlife management agencies (e.g., SDGFP, USFWS) oversee management of wildlife species.

Vegetative treatments would be effective and produce anticipated short-term and long-term results. Vegetative treatments would be expected to benefit wildlife habitat by moving vegetation toward a range of natural variability. Although it is recognized that modifying vegetation could remove or lessen the quality of habitat for some species, it will improve it for others (e.g., reducing overstocked stands of conifers through forest thinning projects may remove security habitat for big game species). Overall, it is assumed that vegetative treatments would have long-term benefits to the majority of wildlife habitats.

Changes to vegetation types in quantity, quality, or increased fragmentation are compared to baseline conditions when available for each alternative. Adverse and beneficial impacts to vegetation types (i.e., wildlife habitats) are assumed to have a corresponding adverse or beneficial impact on wildlife species.

Thresholds for densities of roads and oil and gas wells have been described for big game (Hebblewhite 2008) and long-term significant impacts to big game species. Studies by Hebblewhite have shown that long-term significant impacts to ungulate populations (mule deer and antelope) occurred when oil and gas well densities exceeded between 0.26 and 1.04 wells/mi^2 in big game habitat.

The more acres with an NSO lease stipulation or a No Lease oil and gas designation, the more overall protection a wildlife species would have from oil and gas development. When comparing alternatives, those alternatives with more acres with an NSO stipulation or a No Lease designation would provide the least negative effects to wildlife.

When comparing alternatives, the more acres an alternative has within a timing restriction, the more wildlife species would be protected from disturbance during those crucial seasons of use but only before development (Table 4-37).

Where there are no effects or effects are not known for species or species groups, they are not addressed in the discussion of each alternative.

Loss of habitat, whether direct or indirect, can reduce populations via reduced survival, reduced reproduction, or emigration. Individuals pushed from habitats near disturbances will increase densities on remaining habitats, exposing populations to greater density-dependent effects (Sawyer, et al. 2005).

Table 4-37
Summary of Cumulative Fluid Mineral Lease Stipulations by Alternative
For All RFD Areas
(Acres)

	Alternative A (Current Management)		***Alternative B***		***Alternative C***		***Alternative D (Preferred Alternative)***	
	BLM Surface†	***BLM Mineral***	***BLM Surface***	***BLM Mineral***	***BLM Surface***	***BLM Mineral***	***BLM Surface***	***BLM Mineral***
Closed or No Lease	6,894	7,069	6,574	6,749	100,160	309,751	6,894	7,479
Total NSO	15,489	87,349	105,837	404,306	43,897	355,396	107,025	406,005
Total CSU	2,954	19,613	10,561	158,501	1,535	1,535	10,031	146,574

†Areas with BLM-administered surface are areas above oil and gas mineral estate.

One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008). The scale of development, location and implementation measures all influence the severity of impacts to wildlife habitat and species, including special status species. The more acreage of habitats protected from fragmentation, the greater the benefit to wildlife species.

Prescribed fire, grazing, and forest management are tools used to manage vegetative communities and can result in short-term adverse impacts with long-term beneficial impacts to wildlife and wildlife habitats.

Forest management actions used for managing wildlife habitats instead of, or in addition to, managing forest products are anticipated to benefit most wildlife habitats. It is recognized that modifying forest vegetation could remove or lessen the quality of habitat for some species and improve it for others.

Alternatives providing the greatest protection of water sources beneficial to wildlife are anticipated to have the greatest benefit to wildlife.

Alternatives proposing to protect the most habitats from fragmentation are anticipated to have the most beneficial impact on wildlife.

Prohibiting or excluding surface disturbance or occupancy is more restrictive and provides more protection for wildlife than avoiding surface disturbance or occupancy.

Current accepted science will be used to assist in making sound decision regarding surface-disturbing, disruptive, or other actions throughout the planning area.

New oil and gas development will approximate the existing development rate in potential areas.

Degradation of wildlife habitat quality in the planning area increases with higher road densities. Studies have shown that long-term significant impacts to ungulate populations (mule deer and antelope) occurred when road densities exceed 0.290 and 1.689 linear miles of road/ mi^2 in big game habitat (Hebblewhite 2008).

All known raptor nests were used in the analysis and all raptor nests of unknown species are assumed not to be special status species.

The BLM utilizes best available information, management and conservation plans, and other research and related directives, as appropriate; to guide wildlife habitat management on BLM-administered public land. This information is frequently updated as new information becomes available.

A species can sustain a threshold level of disturbance, disruption or habitat degradation before the population viability is reduced.

Generally, special management areas such as ACECs or SRMAs result in protection and long-term improvement or maintenance of wildlife habitat and species because of numerous restrictions, such as OHV use and mineral exploration and development.

Habitat availability, quality, and amount correlate to the viability, health, and size of wildlife populations that are dependent on the habitat.

The exact locations of future surface-disturbing and disruptive activities cannot be predicted at the RMP level. For analysis purposes, surface-disturbing activities are assumed to occur in vegetation types in proportion to their availability within the planning area. Impact acreage for vegetation types are not absolute, but serve as a relative comparison among alternatives.

Impacts Common to All Alternatives

Water Resources: Implementing rangeland health standards and best management practices to protect beneficial uses of water would enhance wildlife habitat by increasing the amount of desirable vegetation cover, structure, and species diversity, which would also improve water quality, aquatic species habitat, and wildlife species diversity.

Soil Resources: Wildlife habitat would be conserved through conservation and mitigation measures that would be applied prior to surface-disturbing activities to prevent erosion and other degrading effects to soil. This would reduce effects to wildlife habitats by reducing soil erosion and increasing soil health, thereby leading to increased production in forage and

cover. Surface-disturbing activities would include a plan that would also mitigate effects to wildlife and wildlife habitats, including special status species habitat, by restoring habitats to a desired native plant community.

Allowable uses and management actions that could impact wildlife habitats include all surface-disturbing activities, primarily renewable energy and oil and gas activities; disruptive activities, usually related to surface-disturbing activities; and actions that could result in changes to vegetation structure and diversity without intensive soil disturbance. At a variety of intensities, the actions of all alternatives could adversely impact wildlife through the loss, degradation, and fragmentation of habitats, and benefit wildlife through the protection, enhancement, and restoration of habitats.

Vegetative Communities: Vegetative treatments include prescribed burning, mechanical treatments, grazing, interim farming practices, and herbicide use. These activities would maintain or improve wildlife and their habitats in the long term; however, short-term negative impacts would occur including direct mortality of less mobile species, eggs, and nests; habitat alteration due to soil erosion and sedimentation; and displacement of wildlife and special status species due to human disturbance. Long-term beneficial impacts to wildlife and special status species include restoration of native habitats and an increase in healthy rangelands that provide forage, cover, and a prey base.

Riparian and wetland management is on a prioritized basis to meet Standards for Rangeland Health or Desired Future Conditions. Management common to all alternatives include the establishment of priority recovery areas, monitoring efforts, and restrictions on surface disturbance and oil and gas exploration. These management activities would benefit and enhance riparian and wetland areas, indirectly benefiting wildlife and special status species and waterfowl.

Invasive Species: Noxious weeds contribute to loss of wildlife habitats, increase soil erosion, reduce water quantity and quality, and reduce structural and species diversity. Controlling the spread of noxious weeds would maintain wildlife habitats in the long term; however, short-term impacts would occur to wildlife and their habitat. In the long term, wildlife would benefit from the removal of invasive species and noxious weeds and management of healthy native plant communities that provide cover forage and prey base. Comprehensive management plans using IPM methods would be effective in controlling the long-term adverse impacts of noxious weeds.

***Wildlife*:** The program to manage wildlife includes game and non-game species. Implementation of the wildlife program could include surveys, habitat improvement projects, identification of species distribution and key habitat areas. Wildlife restrictions and buffers to surface-disturbing and disruptive activities, oil and gas development and exploration, ROWs, recreation, renewable energy and other development will affect how and where these activities can be authorized. Long-term benefits to wildlife from management programs would include provisions and guidance, monitoring and conservation measures which would benefit and support life cycle requirements for wildlife.

Removing or modifying barriers to wildlife movement, such as fences to allow for wildlife passage, would promote and improve movement across important wildlife corridors and lower mortality.

Following Suggested Practices for Avian Protection on Power Lines (APLIC 2012) for all land use authorizations would minimize electrocutions and collisions, thereby minimizing effects on numerous bird species populations, specifically raptors.

One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008). The scale of development, location and implementation measures would influence the severity of impacts to wildlife habitat and species, including special status species.

Animal damage control would be conducted by the U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS). Control actions are typically applied to coyote, red fox, skunk and other species causing damage within the planning area.

Wildlife habitat will be conserved through the use of conservation measures applied prior to surface-disturbing activities to prevent erosion and other degrading effects to soil. This would also reduce effects to vegetation and wildlife habitats. Surface-disturbing activities will include a mitigation plan to minimize the impacts to wildlife and wildlife habitats, including special status species habitat, by restoring habitats to a desired native plant community.

Generally, actions to conserve special status plant species may improve wildlife habitat and protect wildlife species that occupy similar habitat types or those affected by similar disturbances. Special status plant management objectives (BLM Special Species Policy, 6840 Manual) and management actions will strive to achieve high quality habitats that support native plant populations, which would also support high quality wildlife habitats. These actions include inventories, mapping, discretionary activity impact review, and consultation as appropriate with the USFWS.

In addition to proper specification and design, wildlife escape ramps and fence markers will also be used to reduce direct mortalities, especially for prairie grouse and other bird species.

Bats also can utilize a variety of habitats, but caves and abandoned mines are important features for many bat species. The SDGFP Bat Management Plan will be implemented prior to any closure of features. Bats that use caves for roosting, maternity colonies, or hibernation could be affected by disturbing activities near caves, mines, cliffs, other rock features, and riparian areas.

Migratory Birds: There are a number and diversity of migratory bird species and habitat requirements. The BLM will actively manage for multiple ecosystems and a variety of habitats and conditions when there are no specific management actions for the migratory bird species to protect associated habitats. Specific associated management actions are discussed below according to the following habitat types: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

Forest and Woodland Species: Specific management actions for migratory birds in forests and woodlands are proposed such as retaining a minimum of two snags per acre, which would maintain or increase the availability of a habitat component used by birds, many migratory, for a variety of uses. Removal of conifers within riparian areas and hardwood stands would retain healthy riparian stringers and hardwood stands for greater habitat diversity.

Sagebrush Species: A number of management actions related to sage-grouse conservation would have benefits for all sage-associated birds (Hanser and Knick 2009) such as NSO for oil and gas on or near sage-grouse leks as well as related wildlife stipulations. Under Alternative A, an NSO restriction would apply within 1/4 mile of sage-grouse leks. The NSO restriction would protect only 800 acres of BLM-administered surface and 2,766 acres of mineral estate that is critical sagebrush habitat. In addition, grazing managed for rangeland health under Standards and Guidelines (Appendix A) for all alternatives should benefit sagebrush-associated species.

Grassland Species: Actions such as NSO for activities within critical wildlife life cycle areas would generally provide a benefit for most grassland habitat-associated birds. Implementation of Rangeland Health Standards and Guidelines would occur under all alternatives. Implementation of these Standards and Guidelines would usually benefit most grassland-associated species.

Riparian and Wetland Species: Management actions that protect and conserve riparian and wetland areas, such as NSO in 100 year floodplains, will benefit riparian and wetland species. Actions to protect and conserve water quantity and quality in the planning area would also benefit these species. Implementing grazing management for rangeland health under Standards and Guidelines for all alternatives would benefit riparian-associated species.

The Migratory Bird Treaty Act prohibits the take, capture or kill of any migratory bird, any part, nest or eggs of any such bird (16 U.S.C 703 (a)), and includes all special status avian species. Executive Order 13186 requires the BLM to ensure compliance with the Act. The effects of BLM actions and agency plans on migratory birds evaluated through NEPA will reduce the take of migratory birds and contribute to their conservation.

Many special status migratory birds breed and nest on BLM-administered public lands and winter elsewhere. Although impacts to these species on their winter habitat are not subject to BLM management, impacts to breeding and nesting habitats from surface-disturbing and/or disruptive activities, and management actions on BLM-administered land would be anticipated for migratory birds, but would be minimized through the use of surface reclamation actions and mitigation.

Special Status Species: The program to manage special status species includes threatened, endangered, candidate, and sensitive species and their habitat as designated by the ESA, BLM and the state of South Dakota. Implementation of the program would include surveys, habitat improvement, restrictions and buffers for surface-disturbing and disruptive

activities, development, recreation, or oil and gas exploration in special status species habitat. Related benefits to wildlife habitat would result from the management program for special status species.

Retaining blocks of important habitat and removing barriers to wildlife movement will benefit special status species as well as other wildlife species. Fragmentation is an issue and these actions would minimize fragmentation resulting in large blocks of public lands with fewer barriers enhancing wildlife movement.

Seasonal closures and buffer zones for specific special status species will benefit other wildlife and special status species. Long-term benefits to special status species as a result of management programs will include provisions of guidance, monitoring, and conservation measures.

Special status plant management objectives (BLM Special Species Policy, 6840 Manual) and management actions will strive to achieve high quality habitats that support native plant populations which, in turn, support high quality wildlife habitats. These actions include inventories, mapping, discretionary activity impact review, and consultation as appropriate with the USFWS. Generally, actions to conserve special status plant species will improve other wildlife habitat and protect wildlife species that occupy similar habitat types or those affected by similar disturbances.

Fire Management and Ecology: Prescribed fires, wildland fire, and suppression operations may occur across all alternatives and have both short-term and long-term effects on wildlife. Short-term effects on wildlife include displacement of individuals, mortality for less mobile species, and loss of habitat. Increased human activity and noise associated with wildfire suppression and prescribed fire in areas occupied by bird species would affect behaviors including nesting, foraging, or roosting. Habitat loss may occur with the use of equipment, hand tools, and human activity.

However, habitat manipulations resulting from the use of fire would also benefit wildlife habitat over the long term through improving vegetative conditions by releasing soil nutrients, reducing fuel load, or setting back trees encroaching shrubland or grassland habitats. Fire can also restore conditions that benefit wildlife species favoring early plant succession stages, young age classes of woody plants, or grassland habitats with little residual cover. Long-term impacts can occur, depending upon the severity and extent of the management activities. However, impacts from smaller fires that require less extensive suppression operations are likely to be short-term. Fire would generally improve habitat conditions for most species by reducing dense understory and returning the vegetative community to an earlier stage of succession, increasing forage and cover for a greater diversity of wildlife. Fire can result in removal of excess dead and dying trees, thereby reducing hiding cover for prey species, and reducing potential thermal cover in the winter months. However, in the long term, fire would increase denning habitat by increasing horizontal cover with log and limb fall. Additional aspen growth after a fire would provide for instream uses by beavers, which would generally improve habitat conditions for a variety of wildlife species.

Livestock Grazing: The effects on wildlife from livestock grazing which will occur across all alternatives could include direct competition for forage, water, and space, and indirect habitat alteration through a decrease in vegetation species composition and use of management tools such as range improvements. Improving livestock grazing allotments to meet the Standards for Rangeland Health will enhance wildlife habitat by increasing the amount of desirable vegetation cover, structure and species diversity, which will also improve water quality, aquatic species habitat and wildlife species diversity.

Recreation: Generally, impacts to wildlife from dispersed recreation activities will be low. Recreation management activities that increase human presence would have a short-term, localized impact on wildlife. These activities include hiking, biking, camping, hunting, caving, and sightseeing. Impacts of human activity on big game winter range include direct impacts of loss of habitat and forage occurring from surface-disturbing and other disruptive activities at any time of the year. Indirect impacts of displacement and physiological stress occurring from human presence and activity during the winter will also impact big game winter range and bats in hibernacula.

Travel Management and Transportation: In general, travel management and authorized use activities that result in increased human presence will have a localized impact on wildlife species. Impacts may include increased displacement of wildlife, increased stress during critical time periods, and degradation of habitats. OHV use may alter the seasonal use patterns of many wildlife species, including raptor nesting sites, grouse lekking areas, and all winter habitats. OHV use may also result in the removal of vegetation, soil disturbance, and transport of noxious weeds, and could degrade wildlife habitat. The establishment of Travel Management Areas could result in the reduction of designated road densities and would decrease disturbance to wildlife and their habitat. Over-the-snow vehicles could affect wintering wildlife by increasing displacement and stress during critical time periods.

Lands and Realty: Habitat loss, degradation, fragmentation, and species displacement from linear features, including ROWs, power lines, and utility corridors and other permitted facilities (e.g., communication sites) would occur in the planning area under all alternatives and would result in impacts to wildlife with varying degrees of intensity. ROW-approved actions for power lines and communication sites could include injury and death to bats, raptors and other migratory and resident birds, as a result of collisions (USFWS 2002a). "Utility poles can also impact greater sage-grouse and sharp-tailed grouse by providing perches for predatory birds. Even when these structures are fitted with anti-perching devices, the grouse may perceive the structures as a predation risk without direct mortality, particularly when they are near breeding areas" (Frid and Dill 2002). Increased road density and human presence may increase stress levels of wildlife during sensitive time periods (e.g., breeding, migration, wintering). Some species of grassland birds avoid improved roads. These species include Sprague's pipit, Baird's sparrow, and chestnut-collared longspurs (Sutter, et al. 2000).

Minerals: Operational activity from oil and gas development, mining, and salable minerals extraction occurring during the winter on winter range all contribute to indirect impacts on wildlife when they are most vulnerable. Short-term impacts from salable, leasable and locatable mining activities include displacement of wildlife as a result of human activities and heavy equipment operations in those areas. Common variety mineral extraction may result in short-term and direct impacts to wildlife and associated habitat; however, impacts would be minimal because disturbances are generally small (less than 5 acres).

After completion of mineral development, the area will be reclaimed. However, reclamation efforts do not guarantee that habitat will return to its original function. Reclaimed areas might be more vulnerable to invasion of noxious weeds and might not provide the same habitat, forage, or cover that the original area provided. Reclamation of surface disturbances must also be viewed from the perspective of vegetation succession. Disturbed sites are initially revegetated with early successional species, but given sufficient time without additional disturbance, these species are replaced by late successional species such as sagebrush or pinyon-juniper woodlands. Affected habitats are expected to return to the appropriate late successional plant communities after a recovery period sufficient for the respective late-successional species community.

Renewable Energy: Wind energy facilities and development results in surface-disturbing and disruptive activities that cause habitat loss, degradation, fragmentation, and species displacement from associated above-ground and linear features (e.g., turbines, power lines, substations, and roads). These developments could also include injury and death to bats, raptors, and other resident and migratory birds as a result of collisions, as well as displacement of wildlife species that avoid tall structures. Increased development and human presence increases stress levels of wildlife during sensitive time periods (e.g., breeding, migration, wintering).

Special Designations: Management actions for special designations, including the Fort Meade and Fossil Cycad ACECs described in all Alternatives and the Sage-Grouse ACEC proposed in Alternative C provide protection to wildlife through restrictions on surface disturbances and mineral development as well as OHV use. However, the presence of more recreation values in these areas may also result in increased human presence, resulting in short-term wildlife displacement depending on the amount and timing of such activity. While ACEC designation is often beneficial to wildlife and special status species, some trade-offs from this designation can occur. Visitor use and associated impacts can increase as a result of an ACEC designation and may increase disturbance to wildlife and special status species. This increase would be limited in areas already managed as ACECs such as Fort Meade and Fossil Cycad ACECs. Continuation of the ACEC designation in these areas would generally be beneficial to wildlife and special status species.

Impacts under Alternative A (Current Management)

Estimated short-term direct disturbance from all surface-disturbing activities would occur on approximately 1,966 acres of BLM-administered public lands (Table 4-38). Approximately 1,590 acres of BLM-administered public lands would be reclaimed, resulting in about 376 acres of direct long-term disturbance from all surface-disturbing activities in Alternative A.

Split-estate oil and gas development could result in an additional 392 acres of short-term surface disturbance and 237 acres of long-term surface disturbance. These levels of short-term and long-term surface-disturbance would be similar in all alternatives except for a minor decline in Alternative C.

Table 4-38 Surface Disturbance on BLM Surface by Alternative (Acres)				
	Alternative A (Current Management)	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
Short-Term Disturbance	1,966	2,174	1,651	2,290
Reclaimed Disturbance	1,590	1,849	1,424	1,936
Long-Term Disturbance	376	325	227	354

Water Resources: Under Alternative A, management actions would restrict surface use and occupancy in floodplains of streams and rivers. This would provide some protection of surface water from impacts associated with soil erosion and runoff from disturbed areas and from other actions. Stabilizing watershed conditions in areas with excessive erosion would reduce habitat degradation and disturbance. This mitigation would protect approximately 13,397 acres (about 5 percent) of BLM-administered public land and 63,426 acres of subsurface federal minerals, which would maintain or improve wildlife habitat associated with floodplains and riparian habitat within the planning area, including waterfowl, riparian and wetland species and several species of reptiles and amphibians.

Soil Resources: Under Alternative A, impacts to soils caused by surface-disturbing activities from oil and gas exploration, renewable energy and other development would be mitigated for slopes greater than 30 percent. This restriction would mitigate impacts to soil resources on approximately 8,575 acres of BLM-administered public lands (3.5 percent) and 40,476 acres of subsurface federal minerals in the planning area and would maintain or improve wildlife habitat by reducing surface disturbance and protecting the integrity of habitats.

Vegetative Communities: In this alternative, rangeland uplands and riparian areas would be maintained in or improved to meet PFC, and vegetation treatments would be used to achieve desired plant communities. This would result in localized, short-term impacts to individuals, but in the long term would benefit wildlife habitat by increasing forage for wildlife such as big game species. Treatment of sagebrush habitat critical to antelope and sage-grouse would be evaluated at the project scale; but, if allowed, could result in displacement of individuals, direct loss of eggs or nests, and loss of breeding and brood-rearing habitats for sagebrush obligates. Additionally, on the Fort Meade ACEC (6,574 acres or 2.4 percent), 8 to 12 inches of residual herbaceous growth would be maintained on 50 percent of the uplands. This would enhance and improve herbaceous cover for ground-nesting birds, particularly sharp-tailed grouse and waterfowl species.

Invasive Species: The adherence to seasonal buffer distances for weed applications within suitable nesting habitat of known sage-grouse leks would keep disturbance to a minimum on 47,857 surface acres. Management of noxious weeds would be similar through all alternatives but effective management would depend on the amount of treatment needed to control infestations.

Wildlife

Mammals

Big Game: Under Alternative A, oil and gas activities in big game winter range would be prohibited from December 1 to March 31 (approximately 106,382 acres of BLM-administered lands (38 percent), and 411,150 acres of subsurface). This restriction would minimize short-term direct disturbance and adverse impacts during critical time periods, including animal displacement and disturbance to breeding and seasonal movements. While these management actions would protect direct, short-terms impacts to species, there could be long-term disturbances on crucial winter ranges which could result in long-term changes in big game populations if well densities exceed thresholds (1.04 wells/ mi^2) for maintaining habitat integrity for crucial winter range.

The well density in high potential oil and gas areas would push the 1.04 mean wells/section threshold. At this time the mean wells/ mi^2 is .45 in the high potential areas (Table 4-39), is anticipated to go to .74 mean wells/ mi^2 in the next 20 years, and will likely go over the threshold of 1.04 mean wells/section (Hebblewhite 2008) in areas of high drilling intensity. The moderate (0.29 wells/ mi^2), low (0.093 wells/section), and very low (0.00073 wells/section) would be under the 1.04 mean wells/section.

Table 4-39
Anticipated Well Density (wells per mi^2) on BLM Land by Alternative

Development Potential	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*	*Existing Level Wells/section*
High	.29	.24	.23	.24	.45
Moderate	.18	.14	.13	.14	.11
Low	.08	.06	.06	.06	.013
Very Low	.0007	.0006	.0005	.0006	.000039

Bighorn Sheep: Alternative A would conform with existing guidance which was developed to minimize disease transmission from domestic sheep to bighorn sheep. These management actions do not provide adequate management to minimize disease transmission between wild and domestic sheep, and the potential impacts for disease transmission remains despite these actions. This could result in significant long-term direct impacts to bighorn sheep in the planning area.

Birds

Game Birds: Under Alternative A, an NSO restriction would apply within 1/4 mile of sharp-tailed grouse and greater prairie-chicken leks to limit surface-disturbing and disruptive activities in this habitat. This would result in only 163 acres of subsurface federal mineral estate around leks where direct impacts would be avoided. A seasonal timing restriction would apply from March 15 to July 15 for nesting and brood rearing to minimize disruptive activities to sharp-tailed grouse and greater prairie-chicken leks. This would result in approximately 1,316 acres of BLM-administered surface and 15,378 acres of subsurface habitat surrounding leks where direct impacts would be avoided. Direct effects would be minimized by avoiding direct impacts to nesting and brood-rearing habitats with the timing stipulation; however, the indirect long-term effects would still be present from surface-disturbing and disruptive activities initiated outside the timing restriction during production. Most sharp-tailed grouse nests within 1.3 miles of their lek and disturbances located within that distance would have indirect long-term impacts on sharp-tailed grouse populations (Giesen and Connelly 1993).

Overhead utility lines (commonly referred to as powerlines) create impacts to sharp-tailed grouse and other avian species from direct mortality as a result of collisions of birds with overhead lines. Utility lines also result in increased predation by creating raptor perches. Under Alternatives A and B, burial of new utility lines would be recommended but not required near sharp-tailed grouse leks. As a result, mortality to sharp-tailed grouse and other birds may be higher than under Alternatives C and D which require burial of all new utility lines within two miles of sharp-tailed grouse leks.

Waterfowl: No specific management actions for migratory birds are outlined in Alternative A. High value waterfowl areas would be evaluated to determine the need for fencing to improve and protect the emergent vegetation and other components of waterfowl habitat. These actions would benefit long-term waterfowl reproductive success in the planning area.

Raptors: Under Alternative A, surface-disturbing and disruptive impacts to special status species raptors would be mitigated by stipulations which require an NSO within 1/4 mile of nests. This would result in approximately 1,837 acres of BLM-administered surface (1 percent) and 10,636 acres of subsurface habitat surrounding nesting sites where direct impacts would be avoided. Direct effects would be minimized or reduced by avoiding direct impacts to nesting site habitats with the timing stipulation, but indirect long-term adverse effects associated with production would still be present from surface-disturbing activities initiated outside the timing stipulation.

Migratory Birds: BLM management actions would comply with Executive Order 13186 which protects migratory birds. Under Alternative A, impacts to migratory birds and their associated habitat from other resource uses and use restrictions are described below. Because of the diversity of bird species and habitat requirements, the descriptions of impacts are categorized under the following habitat type and associated bird species: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

Forest and Woodland Species: Under Alternative A, management actions and constraints that would benefit forest and woodland habitat and associated species would be from wildland fire ecology, and BLM management

actions for silviculture treatments, forest products, and insect control would result in short-term habitat disturbances to forest and woodland species. Because of their diverse habitat requirements, some migratory birds would be adversely impacted; however, some species would benefit from the management actions. Collectively, these management actions would reduce the risk of or potential for catastrophic fire, which would result in long-term negative effects for species that associate with dense, older forests.

Sagebrush Species: Species that utilize or are obligate species to sagebrush habitats would benefit from management actions under Alternative A that protect sage-grouse habitat. The area within 1/4 mile of sage-grouse leks would be NSO for oil and gas activities. This would result in 799 acres of BLM-administered land (less than 1 percent) and 2,767 acres of federal mineral estate around leks where direct impacts would be avoided. A seasonal timing restriction would apply from March 1 to June 30 for nesting and brood rearing to minimize surface-disturbing and disruptive activities to sage-grouse. This would result in approximately 46,139 acres (19 percent) of BLM-administered surface and 138,437 acres of subsurface estate surrounding leks where direct impacts would be avoided. Direct effects would be minimized by avoiding direct impacts to nesting and brood-rearing habitats with the timing stipulation; however, the indirect long-term effects would still be present from surface-disturbing and disruptive activities initiated outside the timing restriction during production. These restrictions would minimize surface-disturbing and disruptive activities; however, activities would continue beyond the 1/4 mile buffer zone and would result in fragmentation of crucial sagebrush habitat.

Grassland Species: Alternative A has no specific management actions for migratory birds that utilize grassland, but they would benefit from other NSO and timing limitation stipulations (TL) for sharp-tailed and sage-grouse, and raptors that protect grassland habitats. These species would be impacted by management actions in grassland habitats, such as surface-disturbing and disruptive activities, reclamation, noxious weed control, and livestock and wildlife grazing. The number of acres impacted by short-term and long-term surface disturbance (see Tables 4-23 and 4-24) would directly and indirectly affect populations of these species. Direct effects due to habitat loss are amplified by avoidance of areas with long-term disturbance. Impacts from renewable energy and oil and gas activities would be expected to be the major disturbance action in grassland habitats in the planning area.

Riparian and Wetland Species: Under Alternative A, management actions that provide surface disturbance and disruption restrictions to floodplains and riparian areas from oil and gas development would benefit the riparian and wetland-associated species by minimizing the impact of surface disturbances and disruptions in these areas. The riparian areas within 100 year floodplains would be NSO for oil and gas activities. This would result in 14,191 acres (5 percent) of BLM-administered land and 63,426 acres of federal mineral estate within floodplains where direct impacts would be avoided. Other actions that protect and conserve water quantity and quality in the planning area would benefit these species through enhancing habitat, herbaceous cover, and species diversity in riparian and wetland habitats. Wetland-associated species would be impacted by other biological resource management actions, particularly those pertaining to water, riparian, and wetland habitats.

Special Status Species: Under Alternative A, surface occupancy and use for oil and gas leasing and development would be prohibited within 1/4 mile of wetlands identified as piping plover habitat and within 1/4 mile of wetlands identified as interior least tern habitat. These restrictions would minimize and reduce the potential for adverse impacts such as habitat loss, individual mortality, disturbance to behavior, and loss of nests and eggs. However, Alternative A would not manage impacts to piping plover habitat for other surface-disturbing and disruptive activities. Both piping plovers and least terns would mainly be protected with the floodplains stipulation.

To prevent adverse impacts to peregrine falcons from oil and gas development, surface occupancy and use would be prohibited within one mile of nesting sites. This restriction would protect peregrine falcon nesting sites and minimize or reduce habitat loss and individual mortality. However, Alternative A would not manage impacts to peregrine falcon from other surface-disturbing or disruptive activities.

Oil and gas leasing and development would be prohibited within 1/2 mile of bald eagle nest sites that have been active within the past five years and within bald eagle nesting habitat in riparian areas, affecting no surface acreage and only 259 acres of federal mineral estate. Geophysical exploration would be prohibited. This would ultimately result in greater protection to eagles from oil and gas activity, minimize disturbance to nesting eagles, and increase opportunities for successful breeding.

Oil and gas leasing and development would be prohibited within 1/2 mile of special status raptor nest sites which have been active within the past seven years, affecting only 1,837 acres (1 percent) of federal surface and 10,636 acres of federal mineral estate. Geophysical exploration would be prohibited. This would ultimately result in greater protection to ferruginous hawks from oil and gas activity, minimize disturbance to nesting hawks, and increase opportunities for successful breeding.

To reduce adverse impacts to sage-grouse, oil and gas occupancy and use would be prohibited within 1/4 mile of sage-grouse lek sites, affecting only 799 acres (less than 1 percent) of federal surface and 2,767 acres of federal mineral estate, and a seasonal timing stipulation from March 1 to June 30 within 2 miles of sage-grouse lek sites for nesting and brood-rearing areas would affect 46,139 acres (14 percent) of BLM surface and 138,437 acres of federal mineral estate. In addition, surface use would be prohibited from December 1 to March 31 within crucial winter range for sage-grouse. These management measures would reduce human presence and noise associated with equipment use that would displace sage-grouse as well as other wildlife and special status species. It would not be a requirement to bury power lines in important sage-grouse habitat areas which would provide additional perches for avian predators and could potentially result in increased predation of sage-grouse. However, surface disturbance and disruption in sage-grouse habitat areas beyond near proximity to leks would result in the loss of important habitat and disruption in behaviors such as nesting, brood rearing and foraging of sage-grouse as well as other wildlife species.

Under Alternative A, no management has been designated to benefit important sage-grouse habitat areas delineated as protection priority areas (PPAs), and general habitat areas (GHAs). Under this alternative, management actions would protect sage-grouse activities with buffer restrictions from actual lek sites, with no management actions to protect habitat areas beyond the lek. These broader landscape habitat delineations would not be protected from habitat fragmentation and surface-disturbing and disruptive activities, which could increase the potential for adverse impacts to sage-grouse and sagebrush obligate species.

Aquatic and Fisheries Resources: Under Alternative A, oil and gas leasing would be prohibited within the floodplains of major rivers and on water bodies and streams, affecting 13,397 acres (5 percent) of federal surface and 63,426 acres of federal minerals. In addition, surface occupancy and use would be prohibited within 1/4 mile of designated reservoirs with fisheries, affecting 551 acres (less than 1 percent) of federal surface and 12,548 acres of federal mineral estate. Implementation of these management actions within the planning area would reduce habitat degradation and disturbance within critical wildlife and special status water sources and riparian habitats from oil and gas activity. Species associated with these habitats within the planning area include migratory birds, bald eagle, piping plover, interior least tern, waterfowl, and numerous species of reptiles and amphibians.

Visual Resources: Under Alternative A, VRM Classes would be as follows: Class I (0 acres), Class II (1,229 acres), Class III (4,967 acres) and Class IV (530 acres). In this alternative, 266,704 acres are not designated as a VRM class. This alternative would allow for the surface use and activities in VRM Class III and IV areas, and in some cases actions could be allowed in VRM Class II areas if the contrasting visual elements from the actions can be minimized or eliminated. Therefore, wildlife species would potentially be affected by surface-disturbing and disruptive activities, human presence, the use of equipment, and noise disturbance in areas designated as VRM Class II, III, and IV areas.

Fire Management and Ecology: Under Alternative A, the use of heavy equipment would generally be restricted in riparian areas, streamside zones, and environmentally sensitive areas. This would minimize or reduce impacts to soil, minimize soil erosion, and protect important wildlife habitat. Fire management resulting in habitat manipulations through the use of prescribed fire which could be used as an alternative to mechanical vegetative treatment would benefit wildlife over the long term by improving vegetative conditions that are linked to forage and cover. Annually approximately 213 acres would be treated with prescribed fire.

Forest and Woodland Products: Alternative A would provide for approximately 346 forested acres (less than 0.5 percent) to be mechanically treated annually for forest health, and an additional 213 acres annually would be treated with prescribed fire. Short-term direct impacts to wildlife from these treatments would be minimal because of the limited acreage involved in treatments. Long-term indirect benefits to wildlife would increase because of the increased risk of catastrophic, unplanned wildfire due to the buildup of fuels, and the loss of early successional habitats favored by some species of wildlife. These treatments would provide diversity in these habitats and the effects would be beneficial for most wildlife species as long as treatments in sagebrush habitats are designed to avoid long-term effects to sagebrush habitats.

Livestock Grazing: Changes to rangeland vegetation would be similar across all alternatives. These changes are primarily derived from grazing on these habitats and current grazing management would be beneficial to wildlife by introducing large-scale heterogeneity (see Glossary) in grassland habitats. The impacts of managing livestock grazing include competition for forage, water and habitat use and alteration. The reduction in vegetation due to overgrazing or high numbers of livestock would result in loss of important forage for big game species and nesting cover for birds. Under all alternatives these impacts would be minimized because stocking rates would be low to moderate and grazing would be managed according to Standards and Guidelines. However, grazing from livestock could reduce invasive species and noxious weeds if grazing management maintains a healthy range. Also under Alternative A, a minimum rest period from grazing following any major disturbance to vegetative communities is not specified which would not benefit some wildlife species in the short term; however, long-term goals to promote heterogeneity in grassland habitats would be minimized with this management action as long as grazing within the disturbed areas does not impact soil resources and contribute to increased soil erosion.

Recreation: Alternative A would not have any SRMA or extensive recreation management area (ERMA) designations or associated management for recreational classes. Special recreation permits would be required for any commercial, competitive, group use and/or vending activities in the planning area. Recreational gold panning would be allowed on all streams except at the Fort Meade ACEC and in the Fossil Cycad ACEC area. Under this alternative, snowmobile use would not be restricted in the planning area. Impacts to wildlife from these management activities would include an increase in human presence and noise creating short-term impacts to wildlife and disturbance to behaviors such as breeding and foraging. Other adverse impacts include displacement and direct mortality from motorized use, including snowmobile use, increased trash and human disturbance. Long-term impacts would include habitat loss with the development of permanent structures. Dispersed, casual and non-consumptive activities such as bird watching, hiking, walking, etc. would not be expected to adversely affect wildlife species or degrade habitat in the long term.

Travel Management and Transportation: Under Alternative A, the planning area would be designated as limited for travel and transportation, in which motorized travel would be allowed on existing roads and trails. Motorized, wheeled cross-country game retrieval would not be allowed, and motorized travel to access campsites would be limited to within 300 feet of existing roads. No restrictions would be placed on snowmobile use in the planning area. In addition, roads created through other proposed uses/actions would be constructed to the minimum standard necessary, unless the roads would be needed for other purposes requiring a higher construction standard. The impacts to wildlife as a result of the management actions under Alternative A associated with travel management would include conflicts with motorized activities and road densities within associated habitats. While motorized travel would be limited to existing routes, the potential for route proliferation in high-use areas would result in increased habitat fragmentation and disturbance to wildlife, as well as increased surface disturbance and soil erosion which would degrade habitat. Short-term impacts would include disruption and displacement of individuals and direct mortality to less mobile species. Long-term adverse impacts would include habitat loss and fragmentation with the potential for increased development of roads, either through route proliferation or through construction of new roads. Unrestricted snowmobile use in crucial winter range would adversely impact and disrupt big game species and could displace wildlife. While snowmobile use would be allowed on the Mickelson Trail (between the Deadwood and Dumont Trailheads), the established trail system would concentrate use, resulting in short-term, localized impacts to wildlife species. Alternative A does not allow for cross-country game retrieval in the planning area, which would minimize impacts to vegetation and soil resources, as well as limit disruptions to wildlife from motorized vehicles.

Road density is a relative measure of the risk of noxious weeds because many weeds are spread through vehicle traffic (Bergquist 2007). The risk of noxious weed infestation in Alternative A would be similar to all alternatives until travel management is completed. It is not known if control efforts would minimize impacts to wildlife habitat.

Lands and Realty

Rights-of-Way, Leases and Permits: Under Alternative A, portions of the Fort Meade ACEC would be a ROW exclusion area except for the designated ROW utility corridor. Impacts from the construction of ROWs within wildlife habitat would include short-term disruption and displacement of individuals and direct mortality to less mobile species. Long-term adverse impacts would include habitat loss and fragmentation. Within the Fort Meade ACEC designated corridors would require all new power transmission lines that can be safely buried to be buried. The power line structures that are not buried would create collision potential for avian species and create raptor perches that adversely affect small game and non-game species.

Withdrawals: Under Alternative A, the Fort Meade and Fossil Cycad ACECs would continue to be withdrawn from mineral entry for locatable minerals and closed to oil and gas leasing. No other areas within the planning area would be withdrawn from mineral entry. The withdrawal action in the Fort Meade ACEC would protect important wildlife habitat, eliminate surface disturbance from activities, and minimize habitat fragmentation from ancillary facilities. In the rest of the planning area, there would be no restrictions to surface disturbance, resulting in potential impacts from loss of habitat and displacement due to disturbance and disruption from operation activities.

Land Tenure: Under Alternative A, land tenure adjustments are addressed on a case-by-case basis. The effects of land tenure on wildlife would be beneficial through the consolidation and acquisition of lands that contain habitat and provided protection that would not be afforded by non-federal ownership.

Minerals: Impacts from energy and mineral activities could include disturbance to wildlife species during construction and operation. Adverse impacts would include surface-disturbing and disruptive activities, and increase in human presence, habitat loss and fragmentation, direct mortality of individuals and an increase in noise.

The number of new oil and gas wells on BLM-administered land and federal mineral estate anticipated under Alternative A is 94 wells on federal mineral estate. Most of these wells (44) would be located within the high potential area, based on the reasonably foreseeable development scenario. Most of this disturbance and disruption would occur in grassland/ sagebrush/shrubland habitats.

Under Alternative A, approximately 6,894 BLM-administered surface and 6,894 subsurface acres would continue to be closed to oil and gas leasing. An additional 133,647 BLM-administered surface acres and 556,994 subsurface acres would be available for leasing subject to NSO, CSU or TL stipulations. Also, approximately 103,033 BLM-administered surface and 798,690 subsurface acres would be managed as open to leasing and subject to standard lease terms. These restrictions would benefit most wildlife species and associated habitat located in these areas by minimizing surface-disturbing and disruptive activities and associated avoidance. Impacts under these management activities would include short-term displacement of individuals, disturbance from human presence and equipment use, and habitat loss.

The greatest impact in the life of the plan would occur in the high development potential areas. Within the high potential areas, approximately 12,465 acres of BLM-administered surface (40 percent of the high RFD area) and 28,964 acres of subsurface (26 percent of the high RFD area) are in big game winter range, and almost the entire area is considered seasonal habitat for mule deer. This would result in a direct and indirect loss of most habitat for big game in the high potential areas (Table 4-40).

Table 4-40
BLM Surface and Subsurface Acres for Big Game Winter Range in High and Moderate Development Potential Areas by Alternative

Development Potential	*Surface/ Subsurface Acres*	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*	*Total BLM Acreage by Potential*
High	Surface	12,465	12,465	12,465	12,465	30,772
	Subsurface	28,964	28,964	28,964	28,964	104,403
Moderate	Surface	3,938	3,938	3,938	3,938	6,860
	Subsurface	17,004	17,004	17,004	17,004	113,952

The mean well density in high potential oil and gas areas would push 1.04 mean wells/section threshold for big game winter range. At this time the mean wells/mi^2 is .45 in the high potential areas (Table 4-39), is anticipated to go to .74 mean wells/mi^2 in the next 20 years, and would go over the threshold of 1.04 mean wells/section (Hebblewhite 2008) in areas of high drilling intensity. Some areas could have well densities as high as four wells/section (see Chapter 3 Minerals section). The moderate (0.29 wells/mi^2), low (0.093 wells/section), and very low (0.00073 wells/section) development potential areas would be under the 1.04 mean wells/section.

Alternative A would provide a number of stipulations to minimize disturbance impacts from oil and gas activities at local scales through stipulations that limit timing or distance from key wildlife resource values.

One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008). The scale of development, location and implementation measures all influence the severity of impacts to wildlife habitat and species, including special status species. Application of NSO, CSU, and timing stipulations and lease terms would provide some protection and minimize some of the effects to wildlife and associated habitats. The mineral closure in all alternatives for the Fort Meade ACEC would mitigate mineral exploration and development effects to wildlife habitats because no development actions would occur.

Renewable Energy: Under Alternative A, 5,522 acres would be excluded from renewable energy exploration. Impacts would be specific to the projects proposed and the area where the project would be sited. Adverse impacts to wildlife include habitat disturbance, loss of habitat, individual mortality, noise, and disturbance from increased human presence and activity. Wind energy developments could potentially impact wildlife special status bat and other avian species by increasing collision potential and interrupting behaviors such as breeding, foraging and migration.

Special Designations: Under Alternative A, the Fort Meade and Fossil Cycad ACECs would continue to be designated as ACECs (6,894 acres). Management actions to protect the values associated with both ACECs would protect wildlife habitat by restricting surface-disturbing and disruptive activities, and limiting motorized vehicle use and new road construction. These actions would reduce habitat fragmentation and minimize disturbance to wildlife. While an ACEC designation is often beneficial to wildlife and special status species, some trade-offs from this designation can occur. Visitor use and associated impacts can increase as a result of an ACEC designation and may result in an increase in disturbance to wildlife and special status species.

Impacts under Alternative B

Water Resources: Alternative B and D would include more restrictions to protect watershed conditions, but not as much as Alternative C. All three alternatives provide greater benefits to wildlife than Alternative A. Surface-disturbing and disruptive activities within floodplains and wetland/riparian areas would be prohibited within 300 feet with an NSO for oil and gas development. These areas would be avoidance areas for renewable energy and ROW activity. This would provide some protection of surface water from impacts associated with soil erosion and runoff from disturbed areas and from actions related to fluid mineral development, renewable energy and ROWs activities. Oil and Gas restrictions under Alternatives B, C, and D would protect approximately 30,487 acres of federal surface and 146,169 acres of federal mineral estate within 300 feet of floodplains and wetland/riparian areas, which would maintain or improve wildlife habitat associated with floodplains and riparian habitat within the planning area, including waterfowl, riparian and wetland species and numerous species of reptiles and amphibians.

However, under this alternative, other surface-disturbing and disruptive activities could be allowed from other activities such as range improvements and facilities. These activities could reduce watershed conditions and, therefore, negatively impact sensitive wildlife habitats. Impacts could also result in increased habitat fragmentation, direct disturbance to wildlife, and both short-term and long-term impacts to habitat.

Soil Resources: Under Alternative B, impacts to soils from surface-disturbing and disruptive activities associated with oil and gas exploration and development would be mitigated for sensitive soils and slopes greater than 25 percent through CSU stipulations. These restrictions would require a reclamation and engineering plan to mitigate impacts to soil resources on approximately 57,971 acres (21 percent) of BLM-administered public lands and 329,175 acres of federal mineral estate in the planning area, which would maintain or improve wildlife habitat by reducing surface disturbance and protecting the integrity of habitats.

In addition, use of Rangeland Health Standards and Guidelines or BMPs would be used to assess and mitigate soil disturbance. Although less restrictive than Alternative A, it would protect an additional 5,486 acres of BLM surface and 22,414 acres of federal mineral estate with 25 percent slopes instead of 30 percent slopes. Alternative B is less restrictive on the same acres than Alternative C. Under Alternative B sensitive soils would be avoidance areas (45,954 surface acres) for renewable energy and all other ROWs, these areas would be exclusion areas for Alternative C. These actions would

allow for minimization of long-term habitat disturbance on sensitive soils prone to erosion, which would maintain or improve wildlife habitat.

Vegetative Communities: Alternative B would provide for approximately 400 forested acres to be mechanically treated annually to improve forest health which is less than Alternatives A and C, and an additional 1,000 acres would be treated annually by prescribed burning which is more than Alternative A and less than Alternative C. Short-term direct impacts to wildlife from these treatments could be severe in treated areas. Long-term indirect effects to wildlife would be beneficial because of the decreased risk of catastrophic unplanned wildfire and an increase of early successional habitats favored by some species of wildlife. Long-term indirect effects would be beneficial to most wildlife species provided there is careful planning for burns in sagebrush habitats to avoid impacting the integrity of sagebrush habitats.

Under this alternative, rangeland uplands and riparian areas would continue to be maintained in or improved to meet PFC, and vegetation treatments would be used to achieve desired plant communities. This would result in localized, short-term impacts to individuals, but in the long term would result in beneficial impacts to wildlife habitat by increasing forage for wildlife such as big game species.

Invasive Species: Alternative B restricts spot treatments (using IPM methods) within ¼ mile buffer distances from active raptor nests from March 1 to August 1. This is less restrictive than Alternative A but the same as Alternative D. Alternative C is more restrictive by limiting treatment around raptor nests which have been active within the last seven years. Short-term, localized impacts to wildlife would result from human presence, equipment and noise; however, the impacts would be minimized and reduced through the use of spot treatments in those sensitive habitat areas. In the long term, the treatment of noxious weeds would enhance habitat conditions by promoting native species growth and improved vegetative conditions which would benefit wildlife species and associated habitat.

Wildlife: The number of new wells on BLM-administered mineral estate that is anticipated under Alternative B would be 75 wells. Most of these wells would be located in the high (35.5 wells) and moderate (19.25 wells) development potential areas. The mean well density in high potential oil and gas areas would push the 1.04 mean wells/section threshold for big game winter range. Most of this disturbance would occur in grassland/sagebrush/shrubland habitats. Although many of the short-term effects to wildlife habitat and populations would be mitigated through reclamation, those reclaimed areas adjacent to or surrounding long-term habitat disturbance would not necessarily result in reclaimed wildlife habitat.

Under Alternative B, approximately 6,574 acres of BLM-administered surface lands would be closed to oil and gas leasing to protect the Fort Meade ACEC. An additional 105,837 BLM-administered surface acres and 404,306 federal subsurface acres would be available for leasing with an NSO lease stipulation. Generally, these protections would benefit all wildlife species located in these areas by minimizing surface-disturbing and disruptive activities and associated avoidance areas.

Conservation of sage-grouse priority areas would benefit many other wildlife species as well as grassland and sagebrush obligate species occurring in the area. Alternative B proposes management actions to conserve priority habitat areas (PPAs and 1/2 mile around leks in GHAs) for sage-grouse (84,253 acres). Alternative B would protect 83,454 more acres of BLM-administered surface than Alternative A, since more sage-grouse habitat areas would have restrictions applied, and not just around the lek as presented under Alternative A. Management of priority areas for sage-grouse would minimize adverse impacts from habitat fragmentation and would reduce short-term direct impacts and long-term indirect impacts from disturbances.

Alternative B would provide a number of stipulations to minimize disturbance impacts from oil and gas activities at local scales through stipulations that limit timing or distance from key wildlife resource values. These are addressed below under each wildlife category. The acreage figures are not additive as some resource values overlap.

Mammals

Big Game: Under Alternative B, a timing restriction would prohibit oil and gas activities in big game crucial winter range from December 1 through March 31. This stipulation would minimize surface-disturbing and disruptive activities on approximately 106,382 acres of BLM-administered surface (39 percent) and 411,150 acres of subsurface winter range, and would minimize direct and lower long-term indirect effects to big game populations in all big game winter range. The area would be an avoidance area for renewable energy and ROW development on the above-listed acreages, which would benefit big game species by limiting increased surface disturbance and disruption from potential wind energy

and ROW development and would provide more protection than Alternative A. This alternative provides protection to big game winter habitats and species during the initial development periods and does not provide protection during the short- and long-term operation and maintenance periods. Collectively, these restrictions would minimize short-term direct disturbance and adverse impacts during critical time periods, including animal displacement and disturbance to breeding and seasonal movements. While these management actions would protect direct, short-term impacts to species, long-term disturbances and disruptions on crucial winter ranges could occur which could result in long-term changes in big game populations if well densities exceed the 1.04 wells/section thresholds, especially during high intensity drilling which is anticipated for high development potential areas. Of the 30,772 acres of high development potential, 12,465 acres of BLM-administered surface (40 percent) and 28,964 acres of BLM mineral estate (26 percent) are in big game winter range.

Research focusing on winter range impacts indicates that conversion of native winter range into producing gas fields can affect the habitat selection and distribution patterns of mule deer. Before energy development occurred, the Sublette mule deer population of Wyoming was a healthy and productive population. Over a four year period of energy development ending in 2005, mule deer densities declined significantly by approximately 47 percent whereas in the control area there was no negative trend and mule deer densities were constant and similar to pre-development density on the treatment area. Research has also shown that mule deer avoid otherwise suitable habitats within 1.7 to 2.3 miles of natural gas wells and changes in habitat use were immediate with no evidence of acclimation over time (three years). Observed shifts in deer distribution as the study progressed were toward less-preferred and presumably less-suitable habitats (Sawyer, et. al. 2005, 2008; Hebblewhite 2008). Effects to winter range from existing and future oil and gas development and exploration would be similar to those referenced above and would depend on the rate and location of development.

Limited research also exists for pronghorn antelope. Research findings in Wyoming suggest habitat fragmentation of previously undisturbed habitat resulted in pronghorns reducing their use or abandoning habitat patches of less than 600 acres. This research also indicated radio-marked pronghorn consistently avoided otherwise suitable habitats within 100m of a producing well at all times. Aerial flight data of radio-marked pronghorn indicated complete avoidance of the Jonah gas field, an area of intense development where less than 600 pronghorn spent the winter prior to drilling (Berger, et al. 2006). Effects to winter range from existing and future oil and gas development and exploration would be similar to those referenced above and would depend on rate and location of development.

Most of the high potential oil and gas development is in northwestern SD and these big game populations would receive the greatest impacts and decline.

Bighorn Sheep: Under Alternative B, no change in livestock conversions from cattle to domestic sheep or goats would be allowed in allotments within occupied bighorn sheep range. New sheep and goat allotments or conversions from cattle to sheep or goats would not be permitted within a distance of five miles from known bighorn sheep habitat. Approximately 3,343 acres of BLM-administered lands (surface estate) are on allotments within the five- mile area that would not be authorized to graze sheep or goats. This buffer distance would provide more protection to bighorn sheep from potential disease transmission, forage competition, and habitat degradation compared to Alternative A as the buffer distances are mandatory. Under Alternative A, these buffers distances are not mandatory.

In addition, Alternative B would prohibit surface occupancy in designated bighorn sheep range affecting 788 acres of federal surface. This surface occupancy restriction would apply to oil and gas surface-disturbing and disruptive activities. The area would be an avoidance area for renewable energy and ROW development. This management action would provide more protection to bighorn sheep habitat than in Alternative A. Direct short-term and long-term effects would be minimized by reduced surface disturbance and avoiding increased human presence and disruption.

Birds

Game Birds: Under Alternative B, an NSO lease stipulation within 1/4 mile of sharp-tailed grouse and greater prairie-chicken leks would be required to limit surface-disturbing and disruptive activities in this habitat. This would result in approximately no surface acres of BLM-administered surface and 163 acres of subsurface habitat surrounding leks where direct impacts would be avoided. A seasonal timing restriction would also apply from March 1 to June 30 for nesting and brood rearing to minimize disruptive activities to these species. This would result in approximately 1,316 acres (0.5 percent) of BLM-administered surface and 15,378 acres of subsurface habitat surrounding leks where direct impacts would be minimized. Additionally, the seasonal timing stipulation would minimize short-term direct effects by avoiding direct impacts to nesting and brood-rearing habitats with the timing stipulation. However, the indirect long-term effects would

still be present from surface-disturbing and disruptive activities initiated outside the timing restriction and after development. Most sharp-tailed grouse nests within 1.3 miles of their lek and disturbances located within that distance would have indirect long-term impacts on sharp-tailed grouse populations (Giesen and Connelly 1993). Ongoing studies are showing that sharp-tailed grouse and greater prairie-chickens are traveling farther from leks as habitat becomes more fragmented. (pers. comm. A. Robinson and T. Runia 2010).

Overhead utility lines (commonly referred to as powerlines) impact sharp-tailed grouse and other avian species from direct mortality as a result of collisions of birds with overhead lines. Utility lines also result in increased predation by creating raptor perches. Under Alternative B, burial of new utility lines would be recommended but not required near sharp-tailed grouse leks. As a result, mortality of sharp-tailed grouse and other birds would be higher than under Alternatives C and D which require burial of all new utility lines within two miles of sharp-tailed grouse leks.

Effects to sharp-tailed grouse from various activities are not well understood, but limited research indicates that disturbance of sharp-tailed grouse leks appears to limit reproductive opportunities for both sexes. This can include loss of the lekking area; subsequently, the reproductive potential of the population would only be maintained if females select another lek that affords opportunities for mating. Research has also shown that female sharp-tailed grouse avoid disturbance consistently (Baydack and Hein 1987). Effects from an NSO lease stipulation within 1/4 mile of a sharp-tailed grouse lek would include no direct habitat loss and/or indirect effects such as noise and displacement within 1/4 mile of the lek. The timing stipulation also affords protection for direct and indirect habitat effects only before the development, not during the production of the well or operation and maintenance of the facility or other oil and gas facility.

A recent study in the North Dakota Little Missouri Grasslands found sharp-tailed grouse moved an average of 0.79 miles from the lek to nest. They moved farther from the lek in a developed oil field (0.91 miles) than in undeveloped areas (0.68 miles). The hen survival rate was also greater in the undeveloped areas (Williamson 2009).

Waterfowl: Upland and emergent vegetation in pastures surrounding reservoirs established or rebuilt for waterfowl values would be managed to provide adequate nesting and brood-rearing cover for waterfowl under Alternative B. Management actions would provide long-term benefits for waterfowl production and populations in areas where waterfowl are a priority for wildlife management. Alternative B would prohibit surface occupancy within 300 feet of floodplains of major water bodies, rivers, streams and riparian/wetland areas, affecting 30,487 acres of federal surface and 146,169 acres of federal mineral estate. This would protect important habitat areas for these species and minimize or eliminate surface disturbance and disruption.

Raptors: Under Alternative B, an NSO lease stipulation would restrict surface-disturbing and disruptive impacts within ¼ mile of a raptor nest not deemed as special status species, such as red-tailed hawk, prairie falcon, and short-eared owl nests, which have been active within the last seven years. This would result in 544 acres (0.2 percent) of surface and 3,059 acres of subsurface in habitat surrounding nests where long-term direct and indirect effects to reproductive success of the raptors would be minimized. Suggested Practices for Raptor Protection on Power Lines (APLIC, 2006) would be followed for all land use authorizations.

Migratory Birds: Under Alternative B, impacts to migratory birds and their associated habitat from other resource uses and use restrictions are described below. Because of the diversity of bird species and habitat requirements, the descriptions of impacts are categorized under the following habitat type and associated bird species: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

Forest and Woodland Species: Management actions for silviculture treatments, forest products, and wildfire control would result in short-term disturbance. Approximately 400 forested acres would be mechanically treated annually to improve forest health, which is less than Alternative A. An additional 1,000 acres would be treated annually by prescribed burning, which is more than Alternative A. Because of their diverse habitat requirements, some migratory birds would be adversely impacted; however, some would benefit from these management actions. Snag and cavity-bearing tree removal would be limited to public safety, post-fire salvage and in response to other resource needs. Alternative B would provide greater amounts of these treatments and would benefit migratory birds associated with early successional habitats.

Sagebrush Species: Species that use or depend on sagebrush habitats benefit from management actions for sage-grouse. This action would protect areas from short-term direct impacts and long-term indirect impacts associated with oil and gas and renewable energy development. The PPAs (83,744 acres or 32 percent of BLM-administered surface

and 253,357 acres of BLM mineral estate) are avoidance areas for renewable energy and ROW development and NSO for oil and gas activities in sagebrush habitat and would be beneficial for all sagebrush-associated species. Alternative B also provides for a 1/2 mile NSO from leks and TL of March 1 to July 15 within three miles of sage-grouse nesting and brood-rearing habitat in the sage-grouse GHA. These actions would also benefit sagebrush-associated birds by avoiding short-term direct impacts and long-term indirect impacts in these areas.

Grassland Species: The grassland-associated migratory birds would be impacted by changes to vegetation heterogeneity, both in species composition and structure. Heterogeneity in grasslands throughout the planning area would provide habitat for the entire suite of grassland species. The major surface-disturbing and disruptive activities that alter heterogeneity in the planning area include noxious weeds, widespread heavy grazing, or widespread light grazing. Under Alternative B, grazing management for rangeland health under Standards and Guidelines would benefit grassland-associated species. Weed infestations would be limited through an increase in the acreage with no oil and gas development in the sage-grouse priority areas with CSU stipulations to protect habitat.

The impacts of disruptive activities on migratory birds occur primarily during the breeding period in all general habitat types noted above. In the planning area this generally applies to activities occurring from April 15 to July 15. No restrictions on disruptive activities are specifically noted for migratory birds in Alternative B, but the restrictions for sage-grouse, sharp-tailed grouse, greater prairie-chickens and raptors would be beneficial. There could be detrimental impacts to all species of migratory birds across the planning area where other restrictions on surface-disturbing and disruptive activities for other resources do not provide protection.

Riparian and Wetland Species: Under Alternative B, management actions that provide oil and gas development NSO lease stipulations within 300 feet of floodplains and riparian areas would benefit the riparian and wetland-associated species by minimizing the impact of surface disturbances in these areas. This would protect 30,487 acres of BLM-administered surface and 146,169 acres of BLM minerals. Other actions that protect and conserve water quantity and quality in the planning area would benefit these species through enhancing habitat, herbaceous cover, and species diversity in riparian and wetland habitats. Wetland-associated species would be impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats.

Special Status Species: Under Alternatives B, C, and D, surface occupancy and use for oil and gas leasing and development would be prohibited within 1/4 mile of wetlands identified as piping plover habitat and within 1/4 mile of wetlands identified as interior least tern habitat. These actions are similar to Alternative A; however, in addition to oil and gas, restrictions would apply to renewable energy, ROWs, and salable and other leasable minerals. This would provide added protection from Alternative A. These restrictions would minimize and reduce the potential for adverse impacts such as habitat loss, individual mortality, disturbance to habitat, and loss of nests and eggs. Both piping plovers and least terns would also be protected under the floodplains stipulation.

Alternative B would provide slightly less protection than Alternative A to peregrine falcon nesting sites. Under this alternative, oil and gas surface occupancy and use would be prohibited within 1/2 mile of identified peregrine falcon nesting sites. However, this management action under Alternative B would also apply to renewable energy and ROWs, with potential limits to other proposed surface occupancy uses at the project level to protect habitat. This action would minimize adverse impacts to peregrine falcons and reduce habitat loss and individual mortality.

Oil and gas leasing and development would be prohibited within 1/4 mile of bald eagle nest sites that have been active within the past seven years and within bald eagle nesting habitat in riparian areas, affecting no surface and only 80 acres of federal mineral estate. Geophysical exploration would be prohibited. This would ultimately result in less protection to the bald eagle from oil and gas activity, greater disturbance to nesting eagles, and decreased opportunities for successful breeding.

Oil and gas leasing and development would be prohibited within 1/4 mile of other sensitive raptors nest sites that have been active within the past seven years, affecting 499 acres of BLM surface and 7,510 acres of BLM mineral estate . This would ultimately result in less protection to other sensitive raptors from oil and gas activity. Alternative B would include an avoidance area for renewable energy and ROWs, with other surface occupancy and uses potentially limited or mitigated at the project level to protect habitat.

Alternative B proposes management actions to conserve priority habitat areas for sage-grouse with 83,744 BLM surface acres (31 percent) and 253,357 acres of BLM minerals. These restrictions would provide more protection for sage-grouse habitat. Management of PPAs for sage-grouse would minimize the adverse impacts of habitat fragmentation and minimize short-term direct impacts and long-term indirect impacts from disturbances. Conservation of these priority areas is expected to benefit many other animals as well as grassland and sagebrush bird species occurring there.

To reduce adverse impacts to sage-grouse within the GHA, oil and gas occupancy and use would be prohibited within 1/2 mile of sage-grouse lek sites, affecting 509 acres of federal surface (less than 1 percent) and 2,072 acres of federal mineral estate, and a seasonal timing stipulation from March 1 to June 30 within 3 miles of sage-grouse lek sites for nesting and brood-rearing areas would affect 14,749 acres of BLM surface and 31,522 acres of federal mineral estate. In addition, surface use would be prohibited from December 1 to March 31 within crucial winter rage for sage-grouse. These management measures would reduce human presence and noise associated with equipment use that would displace sage-grouse as well as other wildlife and special status species. However, surface disturbance and disruption in sage-grouse habitat areas beyond the proximity to leks would result in the loss of important habitat and disruption in behaviors such as nesting, brood rearing and foraging for sage-grouse as well as for other species of wildlife. Overhead utility lines (commonly referred to as powerlines) impact sage-grouse and other avian species by causing direct mortality when birds collide with lines and also result in increased predation by creating raptor perches. Under Alternative B, burial of new utility lines would be recommended but not required within one mile of sage-grouse leks and within sage grouse winter range. If not buried, utility lines would be designed or sited (located) to minimize impacts to sage-grouse under Alternative B. While these requirements would benefit sage-grouse, sharp-tailed grouse and other types of birds that are adversely impacted by powerlines, the benefits would be less than Alternatives C and D which require (instead of recommending) burial of all new utility lines within a two mile radius of sharp-tailed and sage-grouse leks and in sage-grouse winter range. The BLM would work with utility companies to reduce impacts to sage-grouse from existing utility lines under all of the alternatives (management common to all alternatives).

Alternative B would manage prairie dog colonies that occur on BLM-administered public lands for their recreational and wildlife values. Treatment of these areas would only be considered for resource damage, public health and safety. This would minimize threats to prairie dog colonies completely on BLM surface, and would benefit other obligate species. Prairie dog towns adjoining public lands would be evaluated for control at the project level when adjoining landowners were controlling their private lands. No more than 15 percent of the total prairie dog acreage would be controlled in any one year.

Aquatic and Fisheries Resources: Under Alternative B, oil and gas leasing would be prohibited within 300 feet of floodplains of major rivers, streams, and on water bodies, protecting 30,487 acres of federal surface and 146,169 acres of federal mineral estate. In addition, surface occupancy and use would be prohibited within 1/4 mile of designated reservoirs with fisheries (551 acres of BLM surface and 12,548 acres of BLM minerals). Implementation of these management actions within the planning area would reduce habitat degradation and disturbance from oil and gas activity within critical wildlife and special status water sources and riparian habitats. Species associated with these habitats within the planning area include migratory birds, bald eagle, piping plover, interior least tern, waterfowl, and numerous species of reptiles and amphibians.

Visual Resources: Under Alternative B, visual resources would include VRM Class I (0 acres), VRM Class II (1,542 acres), VRM Class III (5,258 acres) and VRM Class IV (266,630 acres). In this alternative, a majority of the acreage falls within VRM Class IV areas. This alternative allows for surface use and activities in VRM Class III and IV areas, and in some cases actions could be allowed in VRM Class II areas if the contrasting visual elements from the actions can be minimized or eliminated. Therefore, wildlife species would potentially be affected by surface disturbance, human presence, the use of equipment, and noise disturbance in areas designated as VRM Class II, III and IV areas.

Fire Management and Ecology: Under Alternative B, the use of heavy equipment would generally be restricted in riparian areas, streamside zones, and environmentally sensitive areas. This would minimize or reduce impacts to soil, minimize soil erosion, and protect important wildlife habitat. Fire management resulting in habitat manipulations through the use of prescribed fire, which could be used along with or as an alternative to mechanical vegetative treatment, would benefit wildlife over the long term by improving vegetative conditions that are linked to forage and cover. About 1,000 acres would be treated annually with prescribed fire.

Forest and Woodland Products: Alternative B would provide for approximately 400 forested acres to be mechanically treated annually for forest health. Under this alternative, snag and cavity-bearing tree cutting, removal and offer for sale or utilization would be allowed. Short-term direct impacts to wildlife from these treatments may be severe in treated areas. Long-term indirect effects to wildlife would be beneficial because of the decreased risk of large wildfire and an increase of early successional habitats favored by some species of wildlife. Long-term indirect effects would be beneficial to most wildlife species as long as there was careful planning for burns in sagebrush habitats to avoid impacting the integrity of intact sagebrush habitats.

Livestock Grazing: Impacts and changes to rangeland vegetation would be similar across all alternatives. These changes are primarily derived from grazing on these habitats, and current grazing management would be beneficial to wildlife by introducing large-scale heterogeneity in grassland habitats. In addition, an increase in AUMs may be allowed (up to 5 percent on allotments) if specific allotment management requirements are met. The impacts of managing livestock grazing include competition for forage, water, and habitat use and alteration. The reduction in vegetation due to overgrazing or high numbers of livestock would result in loss of important forage for big game species and nesting cover for birds. However, grazing from livestock could reduce invasive species and noxious weeds or enhance forage and brood-rearing conditions for wildlife species if grazing management maintains a healthy range. Under Alternative B, a minimum rest period from grazing following any major disturbance to vegetative communities is not specified which may result in adverse impacts to some wildlife species in the short term.

Recreation: Under Alternative B, two SRMAs (a total of 11,652 acres) would be designated and managed for recreation and visitor services including the Fort Meade ACEC (6,574 acres) and the Exemption Area (5,078 acres). In addition, approximately 262,680 acres would be designated as an ERMA. The Fort Meade ACEC and the Exemption Area would be managed for Front Country Recreation Setting, and the remaining planning area (except for the Fossil Cycad ACEC) would be managed for Middle Country Characteristics. These recreation classes would provide for recreational opportunities, but limit the level and intensity of development and surface disturbance, thereby minimizing impacts and disturbance to wildlife.

Special recreation permits would be required for any commercial, competitive, group use and/or vending activities in the planning area. Recreational gold panning would be allowed on all streams except in the Fort Meade and Fossil Cycad ACECs; however, gold panning could be restricted in this alternative if monitoring indicates impacts to resources. Under this alternative, snowmobile use would generally not be restricted in the planning area; however, if monitoring indicates resource damage or disruption to wildlife is occurring, limitations could be addressed to minimize the impacts. Impacts to wildlife from these management activities would include an increased human presence and noise creating short-term impacts to wildlife and disturbance to behaviors such as breeding and foraging. Other adverse impacts include displacement and direct mortality from motorized use, including snowmobile use, increased trash, and human disturbance. Long-term impacts would include habitat loss with the development of permanent structures. Dispersed, casual and non-consumptive activities such as bird watching, hiking, walking, etc. would not be expected to adversely affect wildlife species or degrade habitat in the long term.

Travel Management and Transportation: Road density is a relative measure of the risk of noxious weeds because many weeds are spread through vehicle traffic (Bergquist 2007). The risk of noxious weed infestation in Alternative B would be similar to all alternatives until travel management is completed. It is not known if control efforts would minimize impacts to wildlife habitat.

Under Alternative B, the planning area would be designated as limited for travel and transportation, in which motorized travel would be allowed on existing roads and trails. Motorized, wheeled cross-country travel to retrieve downed big game animals would be allowed but limited to 300 feet from the nearest road. Additionally, motorized travel to access campsites would be limited to within 300 feet of existing roads. The impacts to soil and vegetation from cross-country travel limited to 300 feet off existing roads could result in increased noise and disturbance from vehicular travel, including trampled vegetation and rutting, which would degrade wildlife habitat.

No restrictions would be placed on snowmobile use in the planning area unless monitoring indicates impacts or disturbance to wildlife. Unrestricted snowmobile use in winter range would adversely impact and disrupt big game species and could displace wildlife. Impacts from snowmobile use on the Mickelson Trail would be the same as in Alternative A.

In this alternative, new permanent roads could be built for long-term management of areas, but construction would be kept to the minimum standards necessary. The impacts to wildlife as a result of the management actions under Alternative B associated with travel management would include conflicts with motorized activities and road densities within associated habitats. While motorized travel would be limited to existing routes, the potential for route proliferation in high use areas would result in increased habitat fragmentation and disturbance to wildlife, as well as increase surface disturbance and soil erosion which would degrade habitat. Short-term impacts would include disruption and displacement of individuals and direct mortality of less mobile species. Long-term adverse impacts would include habitat loss and fragmentation with the potential for increased development of roads, either through route proliferation or through construction of new roads.

Lands and Realty

Rights-of-Way, Leases and Permits: Under Alternative B, Greater Sage-Grouse PPAs would be managed as ROW and renewable energy avoidance areas, affecting 84,384 acres of federal surface. This would provide more protection to sage-grouse and sagebrush obligate species than in Alternative A by minimizing or eliminating habitat fragmentation and minimizing surface disturbance that could degrade important habitat. In this alternative, all fiber optic, telephone and power lines would be safely buried if possible, or sited to have the least impact on resources. This action would minimize the potential for predation; however, those power line structures that are not buried would create collision potential for avian species and create raptor perches that adversely affect small game and non-game species.

Impacts from the construction of ROWs within wildlife habitat, but controlled within Greater Sage-Grouse PPAs, could be allowed and would include short-term disruption and displacement of individuals and direct mortality of less mobile species. Long-term adverse impacts would include habitat loss and fragmentation. In Alternative B, the Fort Meade ACEC would be an avoidance area for power lines except for the designated corridor. This would benefit wildlife habitat by minimizing habitat fragmentation and the collision potential for avian species.

Withdrawals: Under Alternative B, no areas would be recommended for withdrawal from mineral entry except the Fort Meade ACEC. This would result in more impacts to wildlife than in Alternative A. The potential for mineral development in important wildlife habitat areas would result in habitat loss, surface disturbance, disruption and displacement due to disturbance from operation activities.

Land Tenure: Under Alternative B, land tenure adjustment categories would be established to direct land ownership proposals considered at the project level. Only the Fort Meade ACEC and the Fossil Cycad ACEC are in Category 1 – Retention area with no disposal (6,894 acres of BLM-administered surface). A majority of lands are in Category 2 - Retention with Limited Disposal Potential based on specialist review (186,424 acres), and the most available for disposal would be Category 3 – Disposal contingent on specialist review (86,578 acres). Important wildlife habitat and related resource values would be considered prior to all land exchanges or disposals. Any acquisition of lands with high value vegetative or wildlife habitat would enhance wildlife species in the planning area. Lands that would be disposed of would meet the disposal criteria (see Appendix I), minimizing the loss and maximizing the gain for wildlife.

Minerals: Impacts from energy and mineral activities could include disturbance to wildlife species during construction and operation. In this alternative, mineral development would be allowed while minimizing restrictions. Adverse impacts would include surface disturbance and disruption, increased human presence, habitat loss and fragmentation, direct mortality of individuals, and an increase in noise.

The number of new oil and gas wells on BLM-administered land and federal mineral estate anticipated under Alternative B is 75 wells. Most of these wells would be located within the high potential area based on the reasonably foreseeable development scenario. Most of this disturbance and disruption would occur in grassland/sagebrush/ shrubland habitats.

Under Alternative B, approximately 6,574 BLM-administered surface and subsurface acres would be withdrawn from locatable mineral entry, closed to salable mineral entry, and would remain closed to oil and gas leasing and all other leasable minerals to protect a variety of resource values, in addition to wildlife within the two ACECs. An additional 105,837 BLM-administered surface acres (39 percent) and 404,306 subsurface acres would be available for leasing subject to an NSO lease stipulation. Approximately 71,747 BLM-administered surface (27 percent) and 464,071 subsurface acres would be managed as open to leasing and subject to TL and CSU lease stipulations. These protections would benefit all wildlife species located in these areas by minimizing surface-disturbing and disruptive activities and associated avoidance

as noted above. Under Alternative B, 59,416 BLM-administered surface acres (22 percent) and 487,627 subsurface acres would be open to oil and gas leasing subject to standard terms and conditions.

Although many of the short-term and long-term habitat disturbances would not necessarily result in reclaimed wildlife habitat, the effects to wildlife habitat and populations would be mediated by reclamation.

Alternative B proposes management actions to conserve priority habitat areas for sage-grouse known as PPAs (84,384 acres or 32 percent). Management of priority areas for sage-grouse minimizes the adverse impacts of habitat fragmentation and minimizes short-term direct impacts and long-term indirect impacts from disturbances. Conservation of these priority areas is expected to benefit many other animals as well as grassland and sagebrush bird species occurring there.

Alternative B would provide a number of stipulations to minimize disturbance impacts from oil and gas activities at local scales through stipulations limiting timing or distance from key wildlife resource values.

Renewable Energy: Under Alternative B, a total of 189,153 BLM-administered surface acres would be avoidance areas for commercial renewable energy development. These areas include Greater Sage-Grouse PPAs (84,384 acres of federal surface), BLM-administered lands within 1/2 mile of SRMAs (11,652 acres of federal surface), within big game and sage-grouse crucial winter range (106,382 acres of surface estate), and 14,191 acres of protection for areas in and near riparian areas (floodplains). The acres listed above include surface acres only and are not additive as restricted areas overlap. Alternative B would provide fewer acres protected by PPAs (84,384 acres) versus 96,379 acres protected by PPAs in Alternative C. Outside the PPAs, Alternative B would provide 3 miles of ROW avoidance from sage-grouse leks, while Alternative C would provide 4 miles. Alternative B would have 189,153 surface acres in avoidance areas, as Alternative C would have exclusion areas. Alternative A would provide no acres of protection through the use of PPAs.

In addition, multi-year preconstruction wildlife studies would be completed, which would help identify resource conditions at the project level. Adverse impacts to wildlife would be eliminated or minimized by closing these areas, which would reduce loss of habitat, individual mortality, noise, and disturbance from increased human presence and activity. These restrictions would prevent impacts to wildlife and bat and avian species by minimizing collision potential and not interrupt behaviors such as foraging and migration.

Special Designations: Impacts would be similar to Alternative A. Fort Meade ACEC and Fossil Cycad ACECs would continue to be managed as ACECs (6,894 acres). Management actions to protect the values associated with both ACECs would protect wildlife habitat by restricting surface-disturbing and disruptive activities and limiting motorized vehicle use and new road construction. These actions would reduce habitat fragmentation, minimize disturbance to wildlife, as well as actions that allow vegetative treatments to promote and enhance habitat conditions.

Impacts under Alternative C

Water Resources: Alternative C would provide more protection to water quality by identifying more restrictions to surface occupancy and use. In this alternative, management actions would prohibit surface occupancy and use within 300 feet of hydric soils, riparian areas, floodplains, lakes, ponds, rivers, water bodies, and streams. In addition, proposals for linear ROW crossings would be considered only if no other feasible crossing location is available, and would require off-site mitigation. This would provide protection of surface water from impacts associated with soil erosion, runoff from disturbed areas, and other actions, would stabilize watershed conditions in areas with excessive erosion, and would reduce habitat degradation and disturbance. These restrictions would protect the same acreage as Alternatives B and D, approximately 30,487 acres of BLM-administered public land and 146,169 acres of subsurface federal minerals. This would result in improved wildlife habitat associated with floodplains and riparian habitat within the planning area, including waterfowl, riparian and wetland species, and numerous species of reptiles and amphibians.

Soil Resources: Under Alternative C, impacts to soils from surface occupancy and use would prohibit oil and gas activity and exclude renewable energy development and ROWs on slopes 25 percent or greater. This would be the same for sensitive soils (soils with low restoration potential and low fugitive dust resistance). These restrictions would protect soil resources on approximately 57,971 acres (21 percent) of BLM-administered public lands and 329,175 acres of federal mineral estate in the planning area, which would maintain or improve wildlife habitat by reducing surface disturbance and protecting the integrity of habitats.

Vegetative Communities: Impacts from management actions identified in Alternative C would be similar to Alternative B, except fewer acres of forested habitat (350 acres) would be mechanically treated annually for forest health. An additional 500 acres would be treated annually by prescribed burning. Short-term direct impacts to wildlife from these treatments may be severe in treated areas. Other management actions to improve vegetative condition could result in localized, short-term impacts to individuals, but in the long term would result in beneficial impacts to wildlife habitat by increasing forage for wildlife such as big game species. Treatment of sagebrush habitat critical to antelope and sage-grouse would be evaluated at the project scale but if allowed, could result in displacement of individuals and loss of breeding and brood-rearing habitats for sagebrush obligates.

Invasive Species: Impacts from management actions for noxious weeds and other non-native invasive species would be the same as under Alternative A. Seasonal restrictions from March 1 through July 31 would be required within 1/4 mile buffer distance from raptor nesting sites active over the previous seven years, minimizing or reducing disturbance to raptors during critical life stages. Road density is a relative measure of the risk of noxious weeds because many weeds are spread through vehicle traffic (Bergquist 2007). Management of noxious weeds would be similar through all alternatives but effective management would be dependent on the amount of treatment needed to control infestations. The planning area would remain limited to OHV use in Alternative C, with further travel restrictions within the two ACECs. These restrictions would minimize or reduce habitat fragmentation and minimize disturbance from increased human presence, which would benefit wildlife. In the long term, the treatment of noxious weeds would enhance habitat conditions by promoting native species growth and improved vegetative conditions, which would benefit wildlife species and associated habitat.

Wildlife: Alternative C would provide the most stipulations and would minimize disturbance impacts from oil and gas activities at local scales through stipulations to limit timing or distance from key wildlife resource values. These are addressed below under each wildlife category. The acreage figures are not additive as some resource values overlap. Estimated short-term disturbance from all surface-disturbing activities is 1,651 acres. Approximately 1,424 acres would be reclaimed, resulting in 253 acres of long-term surface disturbance from all surface-disturbing activities in Alternative C (see Table 4-24). The effects of each resource use are described below. The majority of acres disturbed would occur as a result of treatments to manage fuels.

Mammals

Big Game: Under Alternative C, surface-disturbing and disruptive activities and livestock grazing on allotments not meeting Standards for Rangeland Health would be prohibited from December 1 through March 31 within winter range for big game. This would protect 106,382 acres of BLM-administered surface and 411,150 acres of federal mineral estate. This winter range would be an exclusion area for renewable energy development and ROWs. These restrictions would minimize short-term direct disturbance and adverse impacts during critical time periods, including animal displacement and disturbance to breeding and seasonal movements. Impacts would still likely result in long-term indirect disturbances which could impact big game populations if well densities exceed threshold levels in winter range. Expected mean well densities could exceed the threshold of 1.04 wells/mi^2 in high intensity drilling areas that include 12,465 acres of BLM surface and 28,964 acres of federal mineral estate in winter range located in the high potential areas, which would result in long-term indirect effects to big game populations. A decline in populations of big game animals would be expected within high potential areas under Alternative C. The greatest impact in the life of the plan would occur in the high development potential areas. This would result in a direct and indirect loss of most habitat for big game in the high potential areas.

Bighorn Sheep: Under Alternative C, no change in livestock conversions from cattle to domestic sheep or goats would be allowed in allotments within occupied bighorn sheep range. New sheep and goat allotments or conversions from cattle to sheep or goats would be permitted within a distance of a minimum of 15 miles or greater from known bighorn sheep habitat. Approximately 7,590 acres (2.5 percent) of BLM-administered lands are in allotments within the 15-mile buffer that would not be authorized to graze sheep or goats. This buffer distance would provide more protection to bighorn sheep from potential disease transmission, forage competition, and habitat degradation compared to Alternatives A and B.

Similar to Alternative B, oil and gas management actions in Alternative C would prohibit surface occupancy in designated bighorn sheep range (7886 acres of federal surface). Renewable energy development and ROWs would be excluded, as opposed to avoided within Alternatives B and D. These management actions would provide more protection to bighorn sheep habitat than in Alternative A. Direct short-term and long-term effects would be minimized by reduced surface disturbance and avoiding increased human presence and disruption.

Birds

Game Birds: Under Alternative C, an NSO lease stipulation and renewable energy and ROW development exclusion within 1/2 mile of sharp-tailed grouse and greater prairie-chicken leks would be required to limit surface-disturbing and disruptive activities in this habitat. This NSO and exclusion restrictions would result in approximately 30 acres of BLM-administered surface and 805 acres of subsurface estate surrounding leks where direct impacts would be avoided before development. A seasonal timing restriction for oil and gas and all ROWs would apply from March 1 to June 30 within 3 miles of sharp-tailed grouse and greater prairie-chicken leks for nesting and brood rearing to minimize disruptive activities. This timing and exclusion restrictions would result in approximately 2,811 acres of BLM-administered surface and 34,605 acres of subsurface habitat surrounding leks where direct impacts would be avoided before development. Direct effects would be minimized by avoiding direct impacts to nesting and brood-rearing habitats with the timing stipulation; however, the indirect long-term effects would still be present from surface-disturbing and disruptive activities initiated outside the timing restriction where disturbances and disruptions could occur within nesting habitat, potentially leading to population impacts. Most sharp-tailed grouse nest within 1.3 miles of their lek and disturbances located within that distance would have indirect long-term impacts on sharp-tailed grouse populations (Giesen and Connelly 1993). Ongoing studies indicate that sharp-tailed grouse and greater prairie-chickens are traveling farther from leks as habitat becomes more fragmented (pers. comm. A. Robinson and T. Runia). Overhead utility lines create impacts to sharp-tailed grouse and other avian species from direct mortality as a result of collisions of birds with lines and also result in increased predation by creating raptor perches. Under Alternatives C and D, burial of new overhead lines would be required within two miles of sharp-tailed grouse and sage-grouse leks and within sage-grouse winter range (except for cases where lines cannot be safely buried). Compared to Alternatives A and B, these requirements would have a greater beneficial impact to sage-grouse, sharp-tailed grouse and other types of birds that are adversely impacted by overhead lines, as Alternatives A and B address a smaller area around leks (one mile). The BLM would work with utility companies to reduce impacts to avian species from existing overhead lines under all of the alternatives (management common to all alternatives). To a large degree, burial of overhead lines near sage-grouse leks and winter range would benefit sharp-tailed grouse as the range of these two species overlap in many areas.

Waterfowl: The effects to waterfowl under Alternative C would be the same as described under Alternative B.

Raptors: Under Alternative C, an NSO lease stipulation would restrict surface-disturbing and disruptive impacts within 1/2 mile of a raptor nest not deemed as special status species which has been active within the last seven years. This would result in 2,258 acres of surface and 13,674 acres of subsurface in habitat surrounding nests where long-term direct and indirect effects to reproductive success of the raptors would be minimized. A ten-foot limitation would be placed on the height of structures that could be perches, and anti-perch devices would be required within two miles of sharp-tailed grouse and greater prairie-chicken leks.

Migratory Birds: Under Alternative C, impacts to migratory birds and their associated habitat from other resource uses and use restrictions are described below. Because of the diversity of bird species and habitat requirements, the descriptions of impacts are categorized under the following habitat type and associated bird species: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

Forest and Woodland Species: Impacts would be the same as Alternative B.

Sagebrush Species: Sagebrush areas are shown in Map 2-6. Species that use or depend on sagebrush habitats would benefit from management actions for sage-grouse. Alternative C would provide management restrictions by designating Greater Sage-Grouse PPAs as closed (no lease) for oil and gas activity, withdrawals of PPAs from other types of mineral development, and excludes renewable energy development and ROWs, which would protect 96,379 acres of BLM-administered surface and 289,563 acres of federal mineral estate (refer to Maps 2-4 and 2-5 for Greater Sage-Grouse PPAs). This would protect more acres of important habitat for sage-grouse and other wildlife species than Alternatives A or B, and would reduce habitat fragmentation and surface disturbance beyond buffer distances from the leks. These actions would also benefit sagebrush-associated birds by avoiding short-term direct impacts and long-term indirect impacts in these areas. Additional management actions in the sage-grouse GHAs in Alternative C would place an NSO lease stipulation within one mile of a lek. This stipulation would protect from disturbances 767 acres of BLM lands with high value for sage-associated and other migratory birds. Alternative C also provides a seasonal timing limitation within four miles of sage-grouse leks from March 1 to July 15. These restrictions would minimize short-term direct effects to sagebrush habitats on 19,926 of BLM-administered surface and 60,528 acres of subsurface. However, long-term direct and indirect

disturbances within the GHAs would continue to occur within sagebrush habitat, potentially leading to population impacts of sagebrush-associated species. Alternative C would withdrawal locatable minerals in Greater Sage-Grouse PPAs. The only locatable mineral that is currently being developed in sagebrush areas is bentonite (Map 2-8). The withdrawal of locatable minerals in Greater Sage-Grouse PPAs would not result in a substantial reduction of activity associated with mineral development as the majority of moderate to high potential bentonite minerals are already claimed and any withdrawal would not include valid existing rights (existing claims). Under Alternatives C and D, the requirements prohibiting the use of overhead utility lines in sharp-tailed grouse and sage-grouse leks and sage-grouse winter range would offer a higher level of protection to sagebrush and grassland birds that are adversely impacted by overhead utility lines compared to Alternatives A or B.

The closure of other leasable minerals (non-energy leasable minerals) and designation of coal as unsuitable in Greater Sage-Grouse PPAs would result in little change as there is little interest or development potential for these minerals in Greater Sage-Grouse PPAs.

The closure of salable minerals in Greater Sage-Grouse PPAs would result in negligible impacts as there is little interest or potential in sand, gravel or other salable minerals in Greater Sage-Grouse PPAs. Refer to the reasonably foreseeable development section at the beginning of this chapter for additional details about mineral development potential.

Grassland Species: The grassland-associated migratory birds are impacted by changes to vegetation heterogeneity, both in species composition and structure. Heterogeneity in grasslands throughout the planning area would provide habitat for the entire suite of grassland species. The major disruptive activities that alter heterogeneity in the planning area include noxious weeds, widespread heavy grazing, or widespread light grazing. Under Alternative C, grazing management for rangeland health under Standards and Guidelines would benefit grassland-associated species. Weed infestations would be limited under Alternative C through an increase in the acreage with no oil and gas or renewable energy development in the sage-grouse priority area. Under Alternatives C and D, requirements prohibiting the use of overhead utility lines in sharp-tailed grouse and sage-grouse leks and sage grouse winter range would offer a higher level of protection to grassland birds that are adversely impacted by overhead utility lines compared to Alternatives A and B.

The impacts of disruptive activities on migratory birds would occur primarily during the breeding period in all general habitat types noted above. In the planning area this generally applies to activities occurring from April 15 to July 15. No restrictions on disruptive activities are specifically noted for migratory birds in Alternative C, but the restrictions for sage-grouse, sharp-tailed grouse, greater prairie-chickens and raptors would be beneficial. There could be detrimental impacts to all species of migratory birds across the planning area where other restrictions on disturbing and disruptive activities for other resources do not provide protection.

Riparian and Wetland Species: Although there are no specific management actions in Alternative C for migratory birds that use riparian areas and wetlands, these species are impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats as noted above. Under Alternative C, the BLM would limit surface-disturbing and disruptive activities within 300 feet of floodplains through an NSO lease stipulation. This would protect 30,487 acres of BLM-administered surface and 146,169 acres of BLM minerals. This would be a benefit to most riparian and wetland-associated species. Actions associated with waterfowl and fisheries habitat would also benefit a number of wetland-associated migratory birds as well.

Special Status Species: Under Alternative C, impacts to piping plover and interior least tern would be the same as Alternative B.

Alternative C would provide more protection than Alternative B for peregrine falcon nesting sites. Under this alternative, oil and gas surface occupancy and use would be prohibited within one mile of identified peregrine falcon nesting sites. This restriction would also apply to renewable energy and ROWs, with potential limits to other proposed surface occupancy and uses at the project level to protect habitat. This action would minimize adverse impacts to peregrine falcons and would reduce habitat loss and individual mortality by providing a larger buffer around nest sites.

Under Alternative C, oil and gas development would be prohibited within 1/2 mile of bald eagle nest sites that have been active within the past seven years (0 acres of BLM-administered surface and 259 acres of federal mineral estate). This alternative provides more protection to bald eagles than Alternative B. These restrictions would result in greater protection to bald eagles from oil and gas activity, minimize disturbance to nesting eagles, and increase opportunities for successful

breeding. These restrictions would also apply to renewable energy and ROWs, as well as other surface occupancy and uses (reviewed at the project level), to protect or mitigate impacts to bald eagle habitats.

Oil and gas leasing and development would be prohibited within 1/2 mile of other sensitive raptors nest sites that have been active within the past seven years (1,837 acres of BLM-administered surface and 10,636 acres of federal mineral estate). This is more protective than Alternative B. This restriction would also apply to renewable energy and ROWs, with potential limits or mitigation to other project level uses. These management actions would result in greater protection to other sensitive raptors, minimize disturbance to nesting raptors, and increase opportunities for successful breeding.

Alternative C proposes management actions to conserve priority habitat areas for sage-grouse as well as protection around sage-grouse leks. Alternative C would prohibit surface occupancy and use within one mile of sage-grouse leks in GHAs (767 acres of BLM-administered surface and 1,846 acres of federal mineral estate), and would prohibit surface use from December 1 to March 31 within crucial winter range for sage-grouse (approximately 50,791 surface acres and 103,553 subsurface acres). Surface use would be prohibited from March 1 to July 15 in sage-grouse nesting habitat within four miles of a lek in GHAs, which would apply to operation and maintenance of production facilities (19,926 acres of BLM-administered surface and 60,528 acres federal mineral estate).

Alternative C would also propose 96,379 acres of BLM-administered surface and 289,563 acres of federal mineral estate of PPAs for sage-grouse and would provide more protection than under Alternatives A, B, or D. An NSO lease stipulation would be applied in the PPAs, while these areas would be excluded from renewable energy development and ROWs. Management of priority areas for sage-grouse would minimize the adverse impacts of habitat fragmentation and minimize short-term direct impacts and long-term indirect impacts from disturbances. Conservation of these priority areas is expected to benefit many other animals as well as grassland and sagebrush bird species occurring there. Overhead utility lines create impacts to sharp-tailed grouse and other avian species from direct mortality resulting when birds collide with lines and also result in increased predation by creating raptor perches. Under Alternatives C and D, burial of new utility lines would be required within two miles of sharp-tailed grouse and sage-grouse leks and within sage-grouse winter range. Compared to Alternatives A and B, these requirements would have a greater beneficial impact to sage-grouse, sharp-tailed grouse and other types of birds that are adversely impacted by powerlines, as Alternatives A and B recommend but do not require burial of utility lines and these alternatives address a smaller area around leks (one mile). The BLM would work with utility companies to reduce impacts to sage-grouse from existing utility lines under all of the alternatives (management common to all alternatives).

Collectively, these restrictions would provide more protection for sage-grouse habitat than under Alternatives A and B by providing more protection to habitat, minimizing disruptive activities during nesting and brood rearing, reducing surface disturbance, and minimizing habitat fragmentation to these areas.

Alternative C would manage prairie dog colonies that occur on BLM-administered public lands for their wildlife and recreational values. Treatment of these areas would only be considered for resource damage, public health and safety. This would minimize threats to prairie dog colonies completely on BLM surface, and would benefit other obligate species. Prairie dog towns adjoining public lands would be evaluated for control at the project level when adjoining landowners were controlling their private lands. No more than 10 percent of the total prairie dog acreage would be controlled in any one year.

Aquatic and Fisheries Resources: Impacts would be the same as Alternative B.

Visual Resources: Under Alternative C, VRM classes would include VRM Class I (0 acres), VRM Class II (11,590 acres), VRM Class III (181,025 acres) and VRM Class IV (80,815 acres). In this alternative, VRM classes are more restrictive as a majority of the planning area is in the VRM Class III areas. In addition, VRM Class II acres are much higher. This alternative would provide the most protection to maintaining habitat integrity.

Fire Management and Ecology: Impacts would be the same as Alternative B.

Forest and Woodland Products: Impacts under Alternative C would be similar to Alternatives A and B, except fewer acres of forested habitat (350 acres) would be mechanically treated for forest health. An additional 500 acres would be treated annually by prescribed burning. Short-term direct impacts to wildlife from these treatments may be severe in treated areas. Long-term indirect effects to wildlife would be beneficial because of the decreased risk of large wildfire and an increase of

early successional habitats favored by some species of wildlife. Long-term indirect effects would be beneficial to most wildlife species as long as there was careful planning for burns in sagebrush habitats to avoid impacting the integrity of the complete sagebrush habitats. Although many of the short-term effects to wildlife habitat and populations are mediated by reclamation, those reclaimed areas adjacent to or surrounding long-term habitat disturbance do not necessarily result in reclaimed wildlife habitat. Many species often avoid areas of long-term surface disturbance and disruption, resulting in long-term indirect effects.

Livestock Grazing: Changes to rangeland vegetation would be similar across all alternatives. These changes are primarily derived from grazing on these habitats and current grazing management would be beneficial to wildlife by introducing large-scale heterogeneity in grassland habitats. Under Alternative C, approximately 271,000 acres would be open to grazing with forage available for preference on these lands (about 73,400 AUMs). An increase in AUMs would not be allowed, which would reduce impacts to wildlife habitat. The impacts of managing livestock grazing include competition for forage, water, and habitat use and alteration. The reduction in vegetation due to overgrazing or high numbers of livestock would result in loss of important forage for big game species and nesting cover for birds. Grazing from livestock could reduce invasive species and noxious weeds or enhance forage and brood-rearing conditions for wildlife species if grazing management maintains a healthy range. Under Alternative C, a reduction, suspension or elimination of livestock grazing leases could become necessary which would minimize major disturbance to vegetative communities, which in turn would benefit wildlife species and promote heterogeneity in grassland habitats.

Recreation: Under Alternative C, two SRMAs would be designated (11,652 acres) and 262,680 acres would be designated as an ERMA. The ERMAs would indicate custodial management for dispersed recreation. Additionally, Alternative C would manage 178,163 acres for Back Country Recreation Setting Characteristics (more than in Alternative B). In this alternative, an NSO lease stipulation within one mile of SRMAs would provide the most protection to wildlife habitat surrounding these areas. Additionally, no commercial special recreation permits (SRPs) would be issued in the planning area; other SRPs would be issued if consistent with management goals and objectives. Under this alternative, snowmobile use would be restricted to designated roads and trails. Management restrictions would minimize impacts to wildlife by limiting increased human presence through managing for Back Country Recreation Setting Characteristics on a majority of BLM public lands in the planning area, thereby reducing disturbance to wildlife. Prohibiting commercial SRPs would also reduce increased human presence in wildlife habitat, thereby minimizing disturbance to wildlife. Restrictions to snowmobile use would protect individual species from disturbance.

Travel Management and Transportation: Impacts to wildlife from management actions in Alternative C would be similar to Alternative A; however, more restrictions would be placed on snowmobile use and new and/or temporary road construction. These management actions would protect important wildlife habitat by reducing disturbance to wildlife from increased human presence and minimizing habitat fragmentation from route proliferation. Road density is a relative measure of the risk of noxious weeds because many weeds are spread through vehicle traffic (Bergquist 2007). The risk of noxious weed infestation in Alternative C would be similar to all alternatives until travel management is completed. It is not known if control efforts would minimize impacts to wildlife habitat.

Lands and Realty

Rights-of-Way, Leases and Permits: Under Alternative C, all fiber optic telephone, power and other lines would be buried. This would minimize or eliminate the collision potential for avian species and create raptor perches that adversely affect small game and non-game species. Alternative C would designate Greater Sage-Grouse PPAs (96,379 acres of BLM-administered surface) as an exclusion area for renewable energy authorizations and other ROWs. This would provide the greatest protection to sage-grouse, as well as protect critical habitat for obligate and grassland species by eliminating habitat fragmentation at the landscape scale and minimizing surface-disturbing and disruptive activities. Impacts from the construction of ROWs within other important wildlife habitat would include short-term disruption and displacement of individuals and direct mortality of less mobile species. Long-term adverse impacts would include habitat loss and fragmentation.

Withdrawals: Under Alternative C, the Fort Meade ACEC (6,574 acres) and Fossil Cycad ACEC (320 acres) would continue to be withdrawn from mineral entry except for oil and gas, which would be closed to mineral entry in the ACEC. The Black Hills Army Depot and the former Igloo town site would be closed to leasable and salable minerals (including oil and gas), but open to locatable minerals (12,709 acres of subsurface minerals). Greater Sage-Grouse PPAs (93,266 acres of BLM-administered surface and 289,563 acres of subsurface minerals) and 410 acres within Bear Butte

State Park would be recommended for withdrawal from mineral entry. Withdrawals in Greater Sage-Grouse PPAs would have limited benefit as most areas with potential have already been claimed and would not be affected by a mineral withdrawal. In other areas, these management actions would protect wildlife habitat, eliminate surface disturbance from activities related to mineral extraction, and minimize habitat fragmentation from related facilities. In the rest of the planning area, there would be no restrictions to surface disturbance, resulting in potential impacts from loss of habitat and displacement due to disturbance of operation activities.

Land Tenure: Impacts from land tenure adjustment would be the same as identified in Alternative B. The effects of land tenure on wildlife would be beneficial through the consolidation and acquisition of lands that contain wildlife habitat by enhancing connectivity as well as providing management restrictions to protect important wildlife habitats when in federal ownership.

Minerals: Impacts from energy and mineral activities could include disturbance to wildlife species during construction and operation. Adverse impacts would include surface disturbance, an increase in human presence, habitat loss and fragmentation, direct mortality of individuals, and an increase in noise.

The number of new oil and gas wells on BLM-administered land and federal mineral estate anticipated under Alternative C is 43 wells. Most of these wells would be located within the high and moderate development potential areas, based on the reasonably foreseeable development scenario. Most of this disturbance would occur in grassland/ sagebrush/shrubland habitats.

Under Alternative C, approximately 100,160 BLM-administered surface acres and 309,576 subsurface acres would be closed to oil and gas leasing, protecting a variety of resource values in addition to wildlife. An additional 43,897 BLM-administered surface acres and 355,396 subsurface acres would be available for leasing subject to an NSO lease stipulation in Greater Sage-Grouse PPAs. These restrictions would benefit all wildlife species and associated habitat located in these areas by minimizing surface-disturbing activities and associated avoidance. Approximately 47,371 BLM-administered surface acres and 246,224 subsurface acres would be managed as open to leasing subject to TL and CSU stipulations. Also, approximately 52,146 BLM-administered surface acres and 451,382 subsurface acres would be managed as open to leasing and subject to standard lease terms. Wildlife species could be adversely impacted by surface-disturbing activities. Impacts under these management activities would include short-term displacement of individuals, disturbance from human presence and equipment use, and habitat loss.

Alternative C would provide the greatest number of stipulations, compared to other alternatives, to minimize disturbance impacts from oil and gas activities at local scales through stipulations that limit timing or distance from key wildlife resource values.

Short-term effects to wildlife habitat and populations would be minimized or reduced through reclamation of disturbed areas. Reclaimed areas adjacent to or surrounding long-term habitat disturbance do not necessarily result in reclaimed wildlife habitat. Many species often avoid areas of long-term surface disturbance and disruption, resulting in long-term indirect effects.

Although these stipulations would mitigate impacts at local scales, impacts to wildlife often happen at much larger scales. Large-scale impacts to wildlife and wildlife habitats are best described by the density of impacts on the landscape. Impacts to wildlife and wildlife habitat from the development of roads would occur during oil and gas development. Impacts to wildlife populations are often not immediate and may be manifest in population level responses a number of years after the initial disturbance. However, restrictions to route reclamation and development restrictions (to the minimum standard necessary) would minimize these impacts.

One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008). The scale of development, location and implementation measures all influence the severity of impacts to wildlife habitat and species, including special status species. The application of CSU and timing stipulations and lease terms would provide some protection and minimize some of the effects to wildlife and associated habitats. The mineral closure in all alternatives for the Fort Meade ACEC would mitigate mineral exploration and development effects to wildlife habitats because no development actions resultant from mineral exploration and development would occur.

Renewable Energy: Alternative C would result in the most protection to wildlife and wildlife habitat from renewable energy development.

Under Alternative C, a total of 199,420 BLM-administered surface acres would be excluded from commercial renewable energy development. These areas include Greater Sage-Grouse PPAs (96,379 acres of federal surface), sage-grouse brood rearing/nesting habitat in GHAs (20,959 acres), and BLM-administered lands within SRMAs (11,652 acres of federal surface) including a one mile buffer around the SRMAs. Additional exclusion restrictions include big game and sage-grouse crucial winter range (121,406 acres of surface estate), and 14,191 acres of protection for areas in and near riparian areas (floodplains). Outside of Greater Sage-Grouse PPAs, in the General Habitat Areas (GHAs), Alternative C would provide larger exclusion buffers for brood rearing/nesting habitat around sage-grouse leks than Alternatives B and D. Alternative C establishes four mile ROW exclusion areas around leks, compared to 3 mile lek ROW avoidance area in Alternative B and 4 mile in Alternative D. In addition, Alternative C excludes sage-grouse winter range and big game winter range (Map 2-9) from renewable energy development. Alternative C would provide more acres protected by PPAs (96,379 acres) versus 84,384 acres protected by PPAs in Alternatives B and D. Alternative C would provide the most protection from renewable energy development by creating the largest Greater Sage-Grouse PPAs and making them exclusion areas for renewable energy ROWs. Alternative B would provide less protection as it establishes PPAs as ROW avoidance areas for renewable energy ROWs. Like Alternative C, Alternative D makes PPAs exclusion areas for renewable energy ROWs; however, under Alternative D, the PPAs are smaller in size than in Alternative C resulting in less protection for sage-grouse. Alternative A would provide the least protection from renewable energy development as it does not provide any protection through the use of PPAs. Refer to Appendix R for more details about ROW restrictions.

Commercial wind energy development would also be excluded from areas with VRM Class II designations (11,652 acres). Acres listed above include only surface acres and are not additive as some restricted acres overlap.

In addition, no development would be allowed in areas where studies confirm wintering areas, migration or connectivity routes, or breeding concentrations of raptors or other wildlife. Adverse impacts to wildlife would be eliminated or minimized by closing these areas which would reduce loss of habitat, individual mortality, noise, and disturbance from increased human presence and activity. These restrictions would prevent impacts to wildlife and bat and avian species by minimizing collision potential and not interrupting behaviors such as foraging and migration.

Special Designations: The Fort Meade and Fossil Cycad ACECs would continue to be designated as ACECs and their impacts would be the same as Alternative B. Management actions to protect the values associated with these ACECs would also protect wildlife habitat by restricting surface-disturbing activities and limiting motorized vehicle use and new road construction. These actions would reduce habitat fragmentation and minimize disturbance to wildlife.

Under Alternative C, the Greater Sage-Grouse PPAs covering 96,379 acres of BLM administered surface would be designated as an ACEC.

Compared to Alternatives B and D, an ACEC designation of PPAs would not result in any noticeable or measurable benefits to wildlife and special status species as numerous protective measures are already provided through other actions for the Greater Sage-Grouse PPAs or for wildlife and special status species.

Impacts under Alternative D (Preferred Alternative)

Water Resources: Alternative D would provide protection of surface water from impacts associated with soil erosion and runoff from disturbed areas and from other actions as described in Alternatives B and C.

Soil Resources: The impacts from ROW restrictions on sensitive soils and slopes would be the same as Alternative B; with sensitive soils being treated as avoidance areas for renewable energy development and ROWs. This would only minimize the impacts to wildlife but would not provide the same level of protection as an exclusion area because an avoidance area may allow some activities to occur provided there is no other practical means to avoid sensitive soils and the impacts to sensitive soils can be minimized. Sensitive soils are present on approximately 57,971 acres (21 percent) of BLM-administered public lands. Oil and gas activity on sensitive soils would have the same impacts as Alternative B. Under Alternative D, impacts to soils from surface occupancy and use would prohibit oil and gas activity on slopes 50 percent or

greater, while restricting this activity with an NSO stipulation on slopes between 25-50 percent (see Table 4-26). These restrictions would maintain or improve wildlife habitat by reducing surface disturbance and protecting the integrity of habitats.

Vegetative Communities: Impacts would be the same as Alternative B.

Invasive Species: Impacts would be the same as Alternative B.

Wildlife: Alternative D would provide a number of stipulations that would minimize disturbance impacts from oil and gas activities at local scales through stipulations limiting timing or distance from key wildlife resource values. These are addressed below under each wildlife category. The acreage figures are not additive as some resource values overlap.

Mammals

Big Game: Big game winter range would be an avoidance area for renewable energy and ROW development which could lower impacts to big game species by limiting increased surface disturbance and disruption from potential wind energy and ROW development and would provide more protection than Alternative A but less than Alternative C. This restriction would limit surface-disturbing and disruptive activities on approximately 121,406 acres of BLM-administered surface (45 percent) winter range, and could lower direct and long-term indirect effects to big game populations in all big game winter range. This alternative provides protection of the big game winter habitat by making big game winter range an avoidance area for renewable energy development and offering oil and gas development with an NSO on 38,384 acres (14 percent) of BLM-administered surface that are within Greater Sage-Grouse PPAs. Collectively, these restrictions would lower short-term direct disturbance and adverse impacts during critical time periods, including animal displacement and disturbance to breeding and seasonal movements. While these management actions would lessen direct, short-terms impacts to species, long-term disturbances and disruptions on crucial winter ranges would result in long-term changes in big game populations. A review of many ungulate studies indicated that small-scale mitigation could not offset impacts of large-scale development (Naugle, 2011).

Bighorn Sheep: Alternative D would provide for restrictions to minimize disease transmission from domestic sheep to bighorn sheep. The effects would be the same as described in Alternatives B and C.

Birds

Game Birds: Alternative D would provide more protection for game birds than Alternative A or B but would provide less protection than Alternative C, as Alternative D would provide less restrictive oil and gas development and ROW restrictions than Alternative C. In some cases, NSO buffers around sensitive areas or habitat are less and timing limits are shorter (refer to Table 2-1). The beneficial impacts from the reduction of overhead utility lines would be the same as Alternative C.

Waterfowl: The effects to waterfowl under Alternative D would be the same as described under Alternative B.

Raptors: The effects to raptors under Alternative D would be similar to Alternative B except ROW restrictions associated with renewable energy would be similar to Alternative C. The beneficial impacts from the reduction of overhead utility lines would be the same as Alternative C.

Migratory Birds: No specific management actions for migratory birds are outlined in Alternative D. Because of the diversity of bird species and habitat requirements, the descriptions of impacts are categorized under the following habitats: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

Forest and Woodland Species: The effects would be the same as described under Alternative B.

Sagebrush Species: The effects would be the same as described under Alternative B except Alternative D would exclude ROWs for renewable energy, and avoid other types of ROWs which would provide less protection than Alternative C. These restrictions would occur within sage-grouse winter range, one mile of sage-grouse leks outside the PPAs, within the PPAs, and within ¼ mile of sharp-tailed grouse leks; benefiting other sagebrush obligate species. The beneficial impacts from the reduction of overhead utility lines would be the same as described under Alternative C.

Grassland Species: The effects would be the same as described under Alternative C.

Riparian and Wetland Species: The effects would be the same as described under Alternative C except that management addressing ROWs would be less stringent as areas in floodplains would receive ROW avoidance restrictions rather than ROW exclusion restrictions.

Special Status Species: Under Alternative D, impacts to piping plover and interior least tern would be the same as Alternative B.

Impacts to peregrine falcon nesting sites would be the same as Alternative B except ROW restrictions would provide more protection from ROWs associated with renewable energy than Alternative B. Compared to Alternative C, Alternative D would provide fewer acres protected by NSO and ROW restrictions.

Impacts to bald eagle nesting sites would be the same as Alternative C except ROWs for renewable energy would be excluded and avoided for other types of ROWs.

Alternative D would result in fewer acres protected (1/4 mile buffer around nests) through an NSO stipulation near sensitive status raptor species nests (including golden eagles) compared to Alternatives A and C which provide a 1/2 mile NSO buffer. Under Alternative D, renewable energy ROWs would be excluded and other types of ROWs would be avoided; however, the buffer distance would be 1/4 mile instead of the 1/2 mile buffer provided by Alternative C.

Alternative D proposes management actions to conserve priority habitat areas for sage-grouse as well as protection around sage-grouse leks. Surface occupancy and use would be prohibited within one mile of sage-grouse leks in GHAs (2,407 acres of BLM-administered surface and 6,243 acres of federal mineral estate). Surface use would be excluded from December 1 to March 31 within crucial winter range for sage-grouse, and would be avoided from March 1 to July 15 in sage-grouse nesting habitat within four miles of a lek in GHAs (this would apply to operation and maintenance of production facilities).

Alternative D would also result in 83,744 acres of BLM-administered surface estate and 253,357 acres of federal mineral estate protected through establishment of PPAs for sage-grouse. This would provide more protection than under Alternative A and less than Alternative C (same protection as Alternative B). An NSO lease stipulation would be applied in the PPAs, and this would exclude renewable energy and be avoided by other types of ROWs. Management of priority areas for sage-grouse would minimize the adverse impacts of habitat fragmentation and minimize short-term direct impacts and long-term indirect impacts from disturbances. Conservation of these priority areas is expected to benefit many other animals as well as grassland and sagebrush bird species occurring there. The beneficial impacts to sage-grouse from the reduction of overhead utility lines would be the same as Alternative C.

Impacts to prairie dog colonies would be the same as Alternative B.

Aquatic and Fisheries Resources: Impacts would be the same as Alternative B.

Visual Resources: Under Alternative D, visual resources would include VRM Class I (0 acres), VRM Class II (1,542 acres), VRM Class III (10,336 acres), and VRM Class IV (261,552 acres). In this alternative, a majority of the acreage falls within VRM Class IV areas. This alternative allows for surface use and activities in VRM Class III and IV areas, and in some cases actions could be allowed in VRM Class II areas, if the contrasting visual elements from the actions can be minimized or eliminated. Therefore, wildlife species would potentially be affected by surface disturbance, human presence, the use of equipment, and noise disturbance in areas designated as VRM Class II, III, and IV areas.

Fire Management and Ecology: The impacts would be the same as Alternative B.

Forest and Woodland Products: The impacts would be the same as in Alternative B.

Livestock Grazing: The impacts would be the same as in Alternative B.

Recreation: Impacts would be the same as Alternative B.

Travel Management and Transportation: Impacts would be the same as Alternative B.

Lands and Realty

Rights-of-Way, Leases and Permits: A total of 5,836 acres would be excluded, 191,704 acres avoided, and 75,750 acres would be open for ROWs. Exclusion areas would include the Fort Meade and Fossil Cycad ACECs. Other exclusion areas include VRM Class II areas, the Exemption area, Greater Sage-Grouse PPAs, areas around sage-grouse, prairie chicken, and sharp-tail leks, around raptor nests, and in sage-grouse wintering areas.

This would benefit wildlife habitat by minimizing habitat fragmentation and the collision potential for avian species. Impacts for avoidance areas would be the same as Alternative B. A withdrawal of minerals would provide some additional protection, but overall, benefits to wildlife in PPAs would be limited as nearly all high to moderate potential bentonite deposits are already claimed and a withdrawal would honor valid existing rights.

Withdrawals: Under Alternative D, the Fort Meade ACEC (6,574 acres), Fossil Cycad ACEC (320 acres) and 410 acres within Bear Butte State Park would be recommended for withdrawal from mineral entry. These management actions would protect wildlife habitat, eliminate surface disturbance from activities related to mineral extraction, and minimize habitat fragmentation from related facilities. All lands in Greater Sage-Grouse PPAs would be recommended for withdrawal from mineral entry. Greater Sage-Grouse PPAs include 93,266 BLM-administered surface acres and 289,563 acres of BLM administered federal minerals.

Land Tenure: Impacts from land tenure adjustment would be the same as identified under Alternatives B and C.

Minerals: Impacts from energy and mineral activities could include disturbance to wildlife species during construction and operation. Adverse impacts would include surface disturbance, an increase in human presence, habitat loss and fragmentation, direct mortality of individuals, and an increase in noise.

The number of new oil and gas wells on BLM-administered land and federal mineral estate anticipated under Alternative D is 75 wells. Most of these wells would be located within the high and moderate development potential areas, based on the reasonably foreseeable development scenario. Most of this disturbance would occur in grassland/ sagebrush/shrubland habitats.

Under Alternative D, approximately 6,894 BLM-administered surface and 7,304 subsurface acres of BLM-administered surface estate would be closed to oil and gas leasing to protect a variety of resource values in addition to wildlife. An additional 107,025 BLM-administered surface acres and 406,005 subsurface acres would be available for leasing subject to an NSO lease stipulation. These restrictions would benefit wildlife species and associated habitat located in these areas by minimizing surface-disturbing activities and associated avoidance. Approximately 76,852 BLM-administered surface and 487,522 subsurface acres would be managed as open to leasing and subject to TL and CSU stipulations. Also, approximately 52,803 BLM-administered surface acres and 461,747 subsurface acres would be managed as open to leasing and subject to standard lease terms.

Impacts under these management activities would include short-term displacement of individuals, disturbance from human presence and equipment use, and habitat loss. Although these stipulations may mitigate impacts at local scales, impacts to wildlife often happen at much larger scales. Large-scale impacts to wildlife and wildlife habitats are best described by the density of impacts on the landscape. Road effects are discussed in this section since most road development in the planning area is anticipated to be associated with oil and gas activities. Impacts to populations are often not immediate and may be manifest in population level responses a number of years after the initial disturbance.

Renewable Energy: A total of 118,904 acres would be excluded, 78,636 acres would be avoided, and 75,751 acres would be open for renewable energy development. Like Alternative B, the following areas were excluded from commercial renewable energy development: raptor nests; sharp-tail leks; Greater Sage-Grouse PPAs, leks, and winter range; VRM Class II areas; and ACECS. Like Alternative C, the following areas were avoided from commercial renewable energy development: floodplains, soils, reservoirs with fisheries, bighorn sheep habitat, big game winter range, and sharp-tail brood rearing/nesting habitat. The effects would be similar to Alternatives B and C. Alternative D would result in more protection to wildlife and wildlife habitat from renewable energy development than Alternative B, but not as much as Alternative C.

Special Designations: The effects would be the same as under Alternative A.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Impacts from BLM actions under all alternatives are additive to impacts occurring on non-BLM lands throughout the planning area. Non-BLM impacts generally would not vary by alternative and are discussed here as the baseline to which impacts described for BLM actions under each alternative would be added.

The primary direct impact to wildlife habitats in the planning area would be the direct loss of native habitats from conversion to small grain production. Much of this conversion occurred in the past resulting in agricultural lands, primarily in the eastern portion of the planning area. However, continued conversion is expected on private lands in the planning area based on current trends in the Northern Great Plains (Fargione, et al. 2009). In addition, contracts on private lands enrolled in the Conservation Reserve Program in South Dakota and not currently cropped may not be renewed, resulting in additional losses of wildlife habitat (Fargione, et al. 2009). The percentage of non-federal surface ownership converted to cropland will incrementally continue to increase through the life of the plan. Oil and gas activities on non-BLM lands in the planning are projected to vary by RMP alternative.

Renewable energy projects could also impact important wildlife habitat in the planning area. No wind farms are currently in production or are definitely planned in the region. Wind farms placed in high value wildlife habitat could result in significant long-term direct and indirect impacts to many wildlife species from direct mortality (particularly birds and bats) to avoidance, displacement, and habitat fragmentation resulting in population level impacts.

Cumulative impacts to wildlife and wildlife habitats are expected to be most prevalent where BLM lands are mixed with non-federal lands and synergistic effects of direct habitat loss through conversion to cropland and indirect disturbances, primarily from oil and gas activities, are expected to occur. Alternately, large blocks of BLM land or blocks where BLM land is interspersed with private rangeland without high densities of surface-disturbing activities are expected to continue to provide important wildlife habitat.

Cumulative Impacts Common to All Alternatives

The greatest cumulative impacts would occur where important wildlife habitats overlaps with high oil and gas and renewable energy development potential (see Table 4-38) and those areas experiencing conversion of private land rangelands to cropland.

Based on information in the 2011 USDA report and a review of Natural Agriculture Statistics data, Resources Inventory on planted acres, the BLM estimates that a maximum of 66,000 acres of rangeland on non-federal lands are likely to be converted to cropland in the nine counties with substantial amounts of surface estate (Harding, Butte, Lawrence, Pennington, Custer, Fall River, Perkins, Meade and Stanley counties) over the next ten years. If trends continue in this manner, a maximum of 132,000 acres of these lands may be converted to cropland over the next 20 years. The majority of this conversion would result in surface disturbance, although certain farm practices such as no-till farming and other conservation practices would reduce the degree of disturbance. The acres provided are the maximum number of acres that are expected to be converted from grassland to cropland; actual acres may be lower in certain counties such as western Butte County where soils have lower potential for farming. This will vary slightly by alternative.

Oil and gas development could result in conversion of a maximum of 392 acres of short-term disturbance on other lands in the nine-county area. Oil and gas development on private surface and split estate minerals is expected to result in a maximum 237 acres of long-term surface disturbance. Development of other BLM-administered minerals is expected to result in a maximum of 400 acres of short-term disturbance and 100 acres of long-term disturbance in the nine-county area. Bentonite and gravel mining would account for most of the acres disturbed. This will vary slightly by alternative.

The BLM estimates that wind energy development would result in up to 3,500 acres of short-term disturbance and 900 acres of long-term disturbance on lands that are not administered by the BLM (other federal lands, private, state, tribal lands, etc.). The maximum levels of wind energy development on BLM-administered surface estate are expected to result in 924

acres of short-term disturbance and 231 acres of long-term disturbance. This will vary slightly from alternative to alternative.

Cumulative Impacts under Alternative A (Current Management)

The minimal level of protective actions to manage wildlife under Alternative A would slowly degrade existing conditions for special status species and wildlife in portions of the planning area by allowing incremental development of surface-disturbing and disruptive actions, regardless of land ownership and the limited beneficial impacts of the current BLM stipulations to mitigate impacts to wildlife at regional scales. This would result in long-term declines in some wildlife populations in portions of the planning area, particularly the high and moderate oil and gas development potential areas, through direct impacts (increased mortality of individuals) and indirect effects (increased fragmentation and avoidance of impacted areas) as measured by surface-disturbing activity densities. Mean well densities would also exceed thresholds for impacts to sage-grouse in the high intensity drilling areas of the high and moderate oil and gas development potential areas.

Wind energy development is currently open on all BLM surface ownership anywhere in the planning area except the Fort Meade ACEC which is excluded from development in Alternative A. Alternative A has no specific management actions noted that would limit fragmentation of important habitat areas from wind and solar development and this may have short-term and long-term direct and indirect impacts on high value wildlife habitats and wildlife populations associated with those habitats. These impacts would be additive with increased renewable energy development on private lands. Alternative A allows greater renewable energy development than Alternatives B, C and D.

The impacts noted above would be additive to current and continued loss of habitat through conversion to cropland, particularly in those areas where land ownership is fragmented and crop production is adjacent to or nearby BLM lands.

Cumulative Impacts under Alternative B

Management actions proposed under Alternative B would close 6,574 acres of BLM-managed surface and 6,574 acres of subsurface lands to oil and gas leasing, and 105,837 acres of surface and 404,306 acres of subsurface would have an NSO lease stipulation. The greatest cumulative impacts would occur where important wildlife habitats overlap with high oil and gas and renewable energy development potential (see Table 4-38) and in those areas experiencing conversion of private land rangelands to cropland.

Management of these areas would strive to maintain or improve current habitat conditions and would greatly enhance habitat integrity and connectivity providing long-term benefits to other wildlife species in those areas. These actions would help ensure viable populations at a regional scale and provide connectivity to allow for potential range shifts if habitat conditions change.

Despite NSO closure of significant portions of BLM-managed surface and subsurface lands, wildlife habitat conditions would be reduced or changed on private lands within the high and moderate oil and gas development potential areas through incremental development of surface-disturbing and disruptive actions combined with the current level of disturbance. Under Alternative B, mean well densities in high and moderate development potential areas would exceed 1.04 wells per mi^2 (see Table 4-39), especially in high intensity drilling areas, except the low and very low development potential areas.

Wind energy development would be avoided on 189,153 acres of BLM surface ownership (primarily sage-grouse priority areas and ACECs) which would limit the impacts from wind development in those areas. Alternative B would provide management actions that would help avoid fragmentation of important habitat areas and short-term and long-term direct and indirect impacts from wind energy developments would be limited.

While some loss or change of habitat for wildlife would continue on other lands, loss of habitat on BLM-administered lands would be lower than under current management. Actions provided in Alternative B would have beneficial impacts to wildlife by providing adequate levels of protective measures in and around important habitat and limiting disruptive activities during critical periods.

Despite NSO, CSU and TL stipulations on significant portions of BLM-managed subsurface lands, wildlife habitat conditions would slowly degrade in the high, moderate, and low oil and gas development potential areas of private lands

through incremental development of surface-disturbing and disruptive actions combined with the current level of disturbance. A decline in populations of big game animals would be expected within the high, moderate, and low potential areas under Alternative B because of direct impacts (increased mortality of individuals) and indirect effects (increased fragmentation and avoidance of impacted areas) as measured by surface-disturbing activity densities. The greatest impact in the life of the plan would occur in the high development potential areas.

Cumulative Impacts under Alternative C

Management actions proposed under Alternative C would close 100,160 BLM-managed surface and 309,576 subsurface acres to oil and gas leasing. An additional 43,897 surface and 355,396 subsurface acres would have an NSO lease stipulation. PPAs with large blocks of relatively intact habitat would be closed for oil and gas development and managed to maintain habitat integrity for sage-grouse (93,266 BLM-administered surface acres and 289,563 subsurface acres). In most cases, actions that protect sage-grouse and sagebrush habitat are beneficial to wildlife. About half of all lands in PPAs would receive adequate protection for sage-grouse, the other portions in the high to moderate oil and gas development area (private land in the northern portion of PPAs) would receive a level of development on private lands that is detrimental for sage-grouse and wildlife regardless of BLM actions (refer to Map 2-5 for Greater Sage-Grouse PPAs and Figure 4-1 for a display of the oil and gas development potential).

Management of these areas on public land would strive to maintain or improve current habitat conditions and would greatly enhance habitat integrity and connectivity, providing long-term benefits to wildlife species in those areas. These actions would help ensure viable populations at a regional scale and provide connectivity to allow for potential range shifts if habitat conditions change.

Wildlife habitat conditions on private lands would slowly degrade in the high and moderate oil and gas development potential areas through incremental development of surface-disturbing and disruptive actions combined with the current level of disturbance. Under Alternative C, mean well densities on BLM land in high and moderate development potential areas would exceed 1.04 wells/mi^2 (see Table 4-39), especially in high intensity drilling areas. A decline in populations of sage-grouse would be expected within the high and moderate development potential areas under Alternative C because of direct impacts (increased mortality of individuals) and indirect effects (increased fragmentation and avoidance of impacted areas) as measured by surface-disturbing activity densities. Incremental development would continue outside areas where development is precluded or densities are controlled. Wildlife habitat in these areas would remain at risk as the percentage of lands affected by development continues to increase throughout the life of the plan.

A closure/withdrawal of minerals, ACEC designation and ROW exclusion would benefit wildlife and special status species on BLM-administered lands within the PPA through decreased levels of commercial use and less disruptive activities and infrastructure; however, these actions combined with an ACEC designation of PPAs and exclusion of ROWs would, in some cases, force and concentrate this use and infrastructure onto private and non-federal lands within the PPA and onto private and non-federal lands adjacent to the PPA. When this occurs, the BLM would lose control over project design features and mitigation of site-specific impacts, and the BLM would not be able to require disturbed areas to be reclaimed.

Wind energy development would be excluded from 199,420 BLM-administered surface acres which would limit the cumulative impacts of wind development in those areas. Alternative C would provide management actions that would limit fragmentation of important habitat areas such as sagebrush. Short-term and long-term direct and indirect impacts from wind developments would be minimized.

While some of loss of habitat for special status species would continue on other lands, overall loss of habitat on BLM administered lands would be minimal under Alternative C. Actions provided in Alternative C would have beneficial impacts on sensitive species by providing the highest degree of protective measures in and around important habitat and limiting disruptive activities on BLM administered lands the most during critical periods.

Cumulative Impacts under Alternative D (Preferred Alternative)

The management actions for Alternative D would provide the greatest level of protection on BLM administered lands. Since the BLM has no control on other lands in the planning area, some adverse cumulative impacts may occur regardless of BLM actions. Management actions proposed under Alternative D would close 6,894 BLM-managed surface and 7,304

subsurface acres to oil and gas leasing. An additional 107,025 surface and 406,005 subsurface acres would have an NSO lease stipulation. Greater Sage-Grouse PPAs with large blocks of relatively intact habitat would have an NSO stipulation for oil and gas development and would be managed to maintain habitat integrity for sage-grouse (83,744 BLM-administered surface acres and 253,357 subsurface acres). About half of all lands in PPAs would receive adequate protection for sage-grouse, the other portions in the high to moderate oil and gas development area (private land in the northern portion of PPAs) may receive a level of development on private lands that is detrimental for sage-grouse regardless of BLM actions (refer to Map 2-4 for Greater Sage-Grouse PPAs and Figure 4-1 for a display of the oil and gas development potential). In general actions that protect sage-grouse benefit other wildlife species.

There are few areas where incremental development would be avoided and wildlife habitat in the very low development potential area would remain at risk as the percentage of lands affected by development continue to increase throughout the life of the plan.

Wind energy development would be excluded from 118,904 acres and avoided on 78,636 acres of BLM surface ownership, and other ROWs would be excluded on 5,836 acres and avoided on 191,704 acres of BLM surface ownership which would limit the cumulative impact from wind development in those areas. However, Alternative D does identify management actions that would not fragment important habitat areas.

While some of loss of habitat for sensitive status species would continue on other lands, loss of habitat on BLM-administered lands would be minimal under Alternative D. Actions provided in Alternative D would have beneficial impacts on sensitive species by providing adequate protective measures in and around important habitat and limiting disruptive activities during critical periods on BLM administered lands.

Special Status Species

Assumptions and Guidelines

To analyze the potential effects of the alternatives on special status species, information was gathered from existing inventories, management and recovery plans, coordination with the USFWS, SDGFP, South Dakota Natural Heritage Program (SDNHP) database, relevant scientific literature, geospatial habitat models, and other sources identifying the potential distribution of these species in and adjacent to the planning area. The analysis is also based on the professional expertise of BLM specialists.

The analysis was based on the following assumptions:

Direct impacts to special status species could result from direct mortality of individuals, the loss or gain of habitats, or key habitat features. Habitats can be lost and fragmented by activities such as mineral exploration and extraction, vegetation conversion or treatments, fire management, construction and maintenance of roads and trails, and development of renewable energy facilities such as wind energy.

Habitats can also be created through natural processes, vegetation management, and habitat restoration. Human activities such as noise and/or movement associated with surface-disturbing and disruptive activities, management activities, and recreation can impact wildlife, potentially causing abandonment of a nest, breeding area, wintering areas or home range. Disturbances are particularly harmful during sensitive periods. Sensitive periods vary for different species and include periods for nesting and breeding grouse, nesting raptors, and wintering big game and sage-grouse. These disturbances can affect wildlife at local scales or larger scales and the relative effects will vary with the life history of individual species. Generally larger species have a greater range of habitat needs throughout their life span and respond to landscape level disturbances more than smaller species. Big game (deer and antelope) and sage-grouse are two prominent wildlife groups in the planning area that have demonstrated responses to landscape level disturbances. Many of the current stipulations in place to protect wildlife resources are effective at mitigating effects at local scales, but often do not mitigate impacts at larger scales (Naugle, et al. 2009).

Precise quantitative estimates of impacts generally are not possible because the exact locations of future surface-disturbing and disruptive actions are unknown, population data for special status wildlife species are often lacking, or habitat types

impacted by surface-disturbing and disruptive activities cannot be predicted at the RMP level. For analysis purposes, surface-disturbing and disruptive activities are assumed to occur in vegetation types in proportion to their availability within the planning area. Impact acreage for vegetation types are not absolute, but serve as a relative comparison among alternatives.

Thresholds for densities of oil and gas wells and roads have been described for sage-grouse. Effects to sage-grouse populations have been noted when well pad densities exceed one well/mi^2 (Holloran 2005), and long-term significant impacts are expected when well pad densities exceed 2 wells/mi^2 in sage-grouse habitat (Harju 2009, Tack 2010).

Assumptions and guidelines for the Wildlife section are valid for the Special Status Species section.

Actions impacting one species have similar impacts on other species using the same habitats or areas.

New oil and gas development will approximate the existing development rate by potential areas.

Greater benefits to special status species are expected with more acres of habitat protected.

Vegetative treatments would be effective and produce the anticipated short-term and long-term results. Vegetative treatments would be expected to benefit special status species habitat by moving vegetation toward a range of natural variability. Although it is recognized that modifying vegetation could remove or lessen the quality of habitat for some species, it will improve it for others (e.g., reducing overstocked stands of conifers through forest thinning projects may reduce security habitat for big game species). It is assumed that overall, vegetative treatments would have long-term benefits to special status species.

Short- and long-term surface disturbance and disruptions are assumed to occur in vegetation types in proportion to the availability of these vegetation types in the planning area. Impact acreages for vegetation types are not absolute, but serve as a relative comparison among alternatives.

Loss of habitat, whether direct or indirect, can reduce populations via reduced survival, reduced reproduction, or emigration. Individuals pushed from habitats near disturbances will increase densities on remaining habitats, exposing populations to greater density-dependent effects (Sawyer, et al. 2005).

The more acres with an NSO lease stipulation, a No Lease oil and gas designation, or exclusion areas for lands-related actions, the more overall protection a special status species would have from oil and gas and renewable energy development. When comparing alternatives, those alternatives with more acres in NSO, No Lease, or exclusions would provide the least negative effects to special status species. As with NSO stipulations and No Lease designations, when comparing alternatives the more acres an alternative has within a timing limitation or avoidance stipulation, the more special status species would be protected from disturbance and disruption during crucial seasons of use.

Where there are no effects, or effects are not known for species or species groups, they are not addressed in the discussion of each alternative.

The migratory nature and relative mobility of some special status wildlife species (e.g., grassland birds, migratory birds, and raptors) exposes these species to impacts on non-BLM land more so than other species. In the case of migratory species, impacts to winter and migration habitats could adversely impact the viability of some species. Winter and migration habitats are assumed to be at least as important to long-term viability of these species as breeding and nesting habitats.

Impacts are addressed only for BLM sensitive species for which BLM management can impact recovery.

Management toward desired plant communities is assumed to exceed the requirements of managing toward desired future condition.

Alternatives providing the greatest protection to water sources are anticipated to have the greatest benefit to special status species.

Alternatives proposing to protect the most habitats from fragmentation are anticipated to have the most beneficial impact on special status species.

Prohibiting or excluding surface disturbance or occupancy is more restrictive and provides more protection for special status species than timing limitations or avoiding surface disturbance or occupancy.

With regard to surface-disturbing, disruptive or other actions throughout the planning area, current accepted science would be utilized to assist in making sound decisions.

Degradation of special status species habitat quality in the planning area increases with higher road density. Studies have shown that long-term significant impacts to ungulate populations (mule deer and antelope) occurred when road densities exceed 0.290 and 1.689 linear miles of road/mi^2 in big game habitat (Hebblewhite 2008). Road density data in the planning area is not available at this time.

The BLM utilizes best available information, management and conservation plans, and other research and related directives, as appropriate, to guide management of special status species on BLM public land.

Impacts Common to All Alternatives

The following discussions concern management actions and allowable use impacts on groups of special status species in the planning area by alternative. Proactive management actions in the Fluid Minerals section which apply to the protection of special status species are intended to be applied to all surface-disturbing and disruptive activities.

Water: Implementing rangeland health standards and best management practices to protect beneficial uses of water would enhance the habitat for some special status species by increasing the amount of desirable vegetation cover, structure, and species diversity, which would also improve water quality, aquatic species habitat, and wildlife species diversity.

Soil Resources: Wildlife habitat would be conserved, under all alternatives, through conservation and mitigation measures (Appendix B, BMPs; Appendix D, Reclamation Guidelines; Appendix N, Monitoring Guidelines) that would be applied prior to surface-disturbing activities to prevent erosion and other degrading effects to soil. This would reduce effects to wildlife habitats by reducing soil erosion and increasing soil health, thereby leading to increased production in forage and cover. Surface-disturbing activities would include a plan that would also mitigate effects to wildlife and wildlife habitats, including special status species habitat, by restoring habitats to a desired native plant community.

Allowable uses and management actions that could impact special status species habitats include all surface-disturbing activities, primarily renewable energy and oil and gas activities; disruptive activities, usually related to surface-disturbing activities; and actions that could result in changes to vegetation structure and diversity without intensive soil disturbance such as livestock grazing. At various intensities, the actions of all alternatives could adversely impact some special status species through the loss, degradation, and fragmentation of habitats, and benefit other special status species through the protection, enhancement, and restoration of habitats.

Vegetative Communities: The impacts projected to occur to special status species as a result of the various alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Therefore, impacts to special status species from surface-disturbing and disruptive activities and changes in vegetation structure and composition are described under individual alternatives.

Invasive Species: Noxious weeds contribute to loss of special status species habitats, increase soil erosion, reduce water quantity and quality, and reduce structural and species diversity. Controlling the spread of noxious weeds is necessary to maintain wildlife habitats. Targeting and eradicating noxious weeds particularly detrimental to certain special status species habitats are anticipated to benefit wildlife. If the spread of noxious weeds in the planning area continues, adverse impacts to special status species habitats are anticipated, but strong weed control efforts using IPM will be implemented under all alternatives and should mitigate the impacts of weed infestations on wildlife habitat.

Wildlife: Special status wildlife management plans and other draft or upcoming planning efforts would generally improve wildlife habitats (with the exception of certain measures designed to improve habitat for one type or species of wildlife that would decrease habitat quality for another).

Wildlife management emphasis would generally include multi-species benefits and management emphasis would strive to achieve historic and natural habitat conditions. Actions related to general compliance with the ESA would be the same across alternatives. These include reviewing activities for impacts on listed species, consultation with USFWS as appropriate where listed species may be affected, coordination with USFWS on recovery efforts, and management under delisting (if applicable) and other requirements. Where effective, water development projects would be managed to reduce the spread of West Nile Virus, minimizing the effects and reducing losses of wildlife species. The majority would consist of a variety of bird species including sage-grouse.

The four sensitive species bats utilize a variety of habitats, but caves and abandoned mines are important features for many bat species. The SDGFP Bat Management Plan would be implemented prior to any closure of features. Bats that use caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing and disruptive activities near caves, mines, cliffs other rock features, and riparian areas.

There are a number and diversity of special status migratory bird species and habitat requirements. The BLM would actively manage for multiple ecosystems and a variety of habitats and conditions when there are no specific management actions for the migratory bird species to protect associated habitats. Specific associated management actions are discussed below according to the following habitat types: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

Big Game: Fence construction has the potential to affect wildlife habitat use in the planning area, particularly in important habitat areas such as big game winter ranges and movement corridors. Although fences can be utilized to improve overall habitat conditions, fences can have other effects on wildlife including direct mortality, habitat use, and movement in general. BLM fence specifications would be applied to any fence constructed on public lands to minimize effects to big game and numerous other wildlife species movements such as sage-grouse.

Special Status Species

Mammals: Impacts from surface-disturbing activities, disruptive activities, and management actions are anticipated for special status nongame mammals. Surface disturbance is anticipated to have localized adverse impacts to special status nongame mammal habitats including temporary and permanent loss of habitats. Fragmentation and degradation of habitat for special status nongame mammals also is anticipated from surface-disturbing and disruptive activities and associated development.

It is important to note that some special status nongame mammal species may use more than one habitat type.

Birds: Many special status species of migratory birds breed and nest on BLM land and winter elsewhere. Although impacts to these species on their winter habitat are not subject to BLM management, impacts to breeding and nesting habitats from surface-disturbing activities, disruptive activities, and management actions on BLM land are anticipated for migratory birds.

Game Birds: The impacts from specific guidance or management actions for game birds are discussed in the sage-grouse section.

Waterfowl: There are no specific guidance or management actions for waterfowl in Alternatives Common to All section; therefore, there are no impacts to waterfowl from actions common to all alternatives.

Raptors: All new power lines constructed on BLM lands will be required to comply with the most current raptor protection standards, currently Suggested Practices for Avian Protection on Power Lines: The State of the Art 2006 (APLIC 2006). Existing power lines constructed on BLM land would be modified to prevent electrocution of raptors if problems are identified. Management actions are specific to sensitive species raptors under each alternative for oil and gas, renewable energy, and ROW and other surface-disturbing and disruptive activities. At this time, special status raptor species include the bald eagle, northern goshawk, burrowing owl, golden eagle, ferruginous hawk, and peregrine falcon.

Migratory Birds: Because of the number and diversity of special status migratory bird species and habitat requirements, the descriptions of impacts are categorized under the following habitats: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

It should be noted that the Migratory Bird Treaty Act prohibits the take, capture or kill of any migratory bird, any part, nest or eggs of any such bird (16 U.S.C 703 (a)), and includes all special status avian species. NEPA analysis pursuant to Executive Order 13186, which requires the Bureau to ensure compliance with the Act and that the effects of Bureau actions and agency plans on migratory birds are evaluated, should reduce the take of migratory birds and contribute to their conservation.

Forest and Woodland Species – include American three-toed woodpecker, black-backed woodpecker, and red-headed woodpecker. Specific management actions for special status migratory birds in forests and woodlands are proposed in the RMP; however, management actions and constraints are in the Forest and Woodland Products section.

Sagebrush Species – include Brewer's sparrow and loggerhead shrike. A number of management actions related to sage-grouse conservation would benefit all sage-associated birds (Hanser and Knick 2009). In addition, grazing management for rangeland health under the current Standards and Guidelines for all alternatives would benefit sagebrush-associated species.

Grassland Species – include Baird's sparrow, chestnut-collared longspur, dickcissel, long-billed curlew, marbled godwit, and Sprague's pipit. Actions would have benefits for special status grassland bird species as well as all other grassland-associated birds. In addition, prescribed burning and grazing management for rangeland health under Standards and Guidelines for all alternatives would benefit grassland-associated species.

Riparian and Wetland Species – include black tern, Franklin's gull, piping plover, willet, Wilson's phalarope, and interior least tern. No specific special status species management actions are noted for riparian and wetland species, but actions to protect and conserve water quantity and quality in the planning area would benefit these species. Grazing management for rangeland health under Standards and Guidelines for all alternatives would benefit riparian-associated species.

Greater Sage-Grouse: Impacts from surface-disturbing activities, disruptive activities, and management actions are anticipated for sage-grouse across all alternatives. Estimated short- and long-term surface disturbance from BLM actions in the planning area are anticipated to result in loss, degradation, and fragmentation of sagebrush habitat. Oil and gas and renewable energy development are sources of surface disturbance and disruption identified in the planning area under all alternatives, and oil and gas development has been identified as a cause of declining sage-grouse populations (Doherty, et al. 2008, Walker, et al. 2007, Naugle, et al. 2009, Harju 2009). Surface disturbance and disruption is anticipated to have adverse impacts to sagebrush habitats including temporary and permanent loss of habitats across all alternatives. Fragmentation and degradation of habitat for sage-grouse also is anticipated from surface-disturbing and disruptive activities and associated development. Better protection has been given to sage-grouse by designating PPAs to focus protection of the core habitat.

Proper specification and design of fence markers would also be utilized to reduce direct mortalities, especially for prairie grouse and other bird species. Numerous studies and anecdotal evidence indicates high mortality rates can result from fence collisions, especially on newly installed fences near important habitat use areas (such as sage-grouse wintering areas or leks). A recent study in Idaho found 8.3 birds collisions/0.31 miles(500m)/season with more collisions the larger the lek and the closer the fence to the lek. It was also determined that reflectors reduced the collisions per 0.31 miles of fence from 8.3 bird collisions to 2.2 bird collisions (Stevens 2011).

Reptiles and Amphibians: No specific management actions related to the four sensitive species reptiles and two sensitive species amphibians are presented in the RMP. However, as noted above, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial for reptiles and amphibians. Management actions and allowable uses that protect water quality and quantity in wetland and riparian habitats are particularly beneficial for amphibians.

Insects: No specific management actions related to the two special status insect species presented in the RMP. However, as noted above, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial for insects.

Fish: No specific management actions related to special status fish are presented in the RMP. However, as noted above, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial for fish. Management actions and allowable uses that protect water quality and quantity and riparian habitats are particularly beneficial for fish.

Plants: No specific guidance or management actions related to special status plants are presented as Management Actions Common to All Alternatives in the RMP. There are management actions in the alternatives that will be discussed later. However, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial for to special status plants. Management actions and allowable uses that protect upland and riparian habitats are particularly beneficial for special status plants.

Mussels and shellfish*:* Other than efforts focused on the control of the spread of invasive mussels, no specific guidance or management actions related to special status mussels and shellfish are presented in the RMP. However, as noted above, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial to mussels and shellfish. The BLM would take into consideration the State of South Dakota Action plan for mussels (currently being developed) when undertaking any action that may impact these species.

Fire Management and Ecology, and Forest and Woodland Products: Wildfire and prescribed fire removes vegetation and can impact soils. Although wildfire can adversely impact special status species habitats in the short term by removing vegetation, the long-term benefits of wildfire often outweigh the short-term adverse impacts in most cases. Wildfire can improve the quality of wildlife habitats by releasing soil nutrients, reducing fuel load, or setting back trees encroaching into shrubland or grassland habitats. Fire can be used to restore conditions benefiting special status species favoring early plant succession stages, young age classes of woody plants, or grassland habitats with little residual cover. The reduction of wildfire can have adverse impacts to special status species habitats. For example, fuels tend to build under repeated fire suppression, sometimes resulting in intense wildfires that can cause long-term adverse impacts to soils and subsequent revegetation. Fire suppression in forests also results in loss of fire-induced wildlife habitats. Fire suppression activities remove vegetation and disturb soil. Suppression activities can have both short- and long-term impacts to habitats. Construction of fire lines can cause habitat loss, degradation, and fragmentation in the short term. Timely rehabilitation of the effects of fire suppression is important to maintaining the quality of special status species habitats. Fire suppression would be responded to differently in association to some special status species and their habitat, such as the sage-grouse.

Livestock Grazing and Vegetative Communities – Rangeland: Cattle grazing remains the most extensive and pervasive impact to vegetation structure in the planning area, but grazing is a natural disturbance in this area and implementation of the grazing Standards and Guidelines has improved range conditions and thus habitat values for most species in the planning area. Failure to implement proper livestock grazing management can degrade special status species habitats through removal of vegetation, disturbance and compaction of soil, and transport of noxious weeds. Aside from transporting noxious weeds, the most impact to special status species habitats from livestock is anticipated in concentrated areas, such as water sources and riparian areas. In general, proposed grazing management will be beneficial to wildlife by introducing large-scale heterogeneity and maintaining rangeland health in grassland and shrub habitats. Continue proper management of livestock grazing through the implementation of Standards and Guidelines can minimize adverse impacts to wildlife.

Potential effects from adjustments in livestock grazing preferences based on resource conditions within an allotment would include an overall improvement in habitat conditions. Effects to wildlife habitat include drought, fire, flood, and insect infestation. Changes in allotment categories as new information becomes available (such as habitat monitoring, habitat assessments, or other wildlife habitat or species data) would improve overall wildlife habitat conditions by requiring special grazing management of a particular allotment or allotments throughout a particular habitat type (i.e., sage-grouse brood-rearing or breeding habitat).

Lands and Realty: Rights-of-way and ROW corridors occur in the planning area under all alternatives and impact special status species in varying ways. Utility poles may benefit some birds by providing perching or nesting structures; however, these same utility structures also can cause mortality through electrocution and collisions (USFWS 2002a). Utility poles can also impact sage-grouse by providing perches for predatory birds. Wind energy facilities are a particular type of right-of-way action that can be a source of mortality for special status species birds and bats when they collide with wind tower blades. High mortality could result if wind towers are placed along a migration path, connectivity corridors or within nesting territories. Wind energy facilities also result in direct impacts through habitat loss by construction and maintenance of wind towers and associated facilities as well as indirect impacts due to avoidance of wind farm areas.

Following Suggested Practices for Avian Protection on Power Lines (APLIC 2006) would minimize electrocutions and collisions, thus minimizing effects on numerous bird species populations, specifically raptors.

Land tenure adjustments would acquire lands with special status habitats and other wildlife values. These land acquisitions could bring inholdings into federal ownership and help secure habitats from further fragmentation. Additional lands could be acquired that have high or special habitat values.

Fluid Minerals: Oil and gas development (well pads and associated roads) is anticipated to be one of the main contributors to long-term surface disturbance and loss of special status species habitats in the planning area through BLM management actions. Certain areas would have greater impacts from oil and gas activities compared to other areas such as high intensity drilling areas. The location and density of individual gas wells in the planning areas are determined by the geology and oil and gas resource distribution. The SDFO has 30,772 acres of surface and 104,403 acres of subsurface in high potential, 6,860 acres of surface and 113,952 acres of subsurface in moderate potential, 56,060 acres of surface and 335,209 acres of subsurface in low potential, and 134,723 acres of surface and 1,771,245 acres of subsurface in very low fluids potential. See Table 4-39 for estimated well densities.

Renewable Energy: Wind energy facilities and development results in surface-disturbing and disruptive activities that cause special status species habitat loss, degradation, fragmentation, and species displacement from associated above-ground and linear features (e.g., turbines, power lines, substations, and roads). See Table 4-41 for total acres of renewable energy surface disturbance (short-term, reclaimed, and long-term) by alternative. These developments could also include injury and death to special status bats, raptors, migratory birds and other resident birds as a result of collisions as well as displace special status and other wildlife species that avoid tall structures. Increased development and human presence would act to increase stress levels of special status wildlife during sensitive time periods (e.g., breeding, migration, wintering).

Table 4-41
Renewable Energy Surface Disturbance on BLM Surface by Alternative (Acres)

	Unconstrained	***Alternative A (Current Management)***	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
Short-Term Disturbance	1,195	924	768	311	520
Reclaimed Disturbance	895	693	576	233	390
Long-Term Disturbance	300	231	192	78	130

Source: Wind Energy Development Scenario (refer to beginning of this chapter).

Special Designations: Management actions for special designations, including the Fort Meade and Fossil Cycad ACECs, would provide protection to special status wildlife through restrictions on surface disturbances and disruptions, mineral and renewable energy development, as well as OHV use. However, the presence of more recreation values in these areas may also result in increased human presence, resulting in short-term wildlife displacement, depending on the amount and timing of such activity.

Impacts under Alternative A (Current Management)

Water Resources: Under Alternative A, management actions would restrict surface use and occupancy in floodplains of streams and rivers. This would provide some protection of surface water from impacts associated with soil erosion and

runoff from disturbed areas and from other actions. Stabilizing watershed conditions in areas with excessive erosion would reduce habitat degradation and disturbance to special status species. This mitigation would protect approximately 13,397 acres of BLM-administered public land (about 5 percent) and 63,426 acres (subsurface federal minerals) which would maintain or improve special status species and other wildlife habitat associated with floodplains and riparian habitat within the planning area, including waterfowl, riparian and wetland species, and several species of reptiles and amphibians.

Soil Resources: Alternative A addresses surface-disturbing activities for soils with severe erosion hazard at the time of development, drilling, production, or plugging. This could mitigate impacts to soil resources on up to 8,575 acres in the planning area and would be beneficial for special status species and other wildlife in the planning area by minimizing short-term direct impacts and long-term indirect impacts to wildlife habitat associated with these soil features.

Estimated short-term disturbance from all surface-disturbing activities is 1,966 acres. Approximately 1,590 acres would be reclaimed, resulting in 376 acres of long-term surface disturbance from all surface-disturbing activities in Alternative A.

Vegetative Communities – Riparian and Wetlands: Alternative A does provide some protection of riparian habitat from impacts associated with soil erosion and runoff from disturbed areas and from other actions with an NSO lease stipulation for floodplains and associated riparian habitats. This would mitigate short-term direct and long-term indirect impacts to 13,397 acres (5 percent) of BLM-administered surface and 63,426 subsurface acres of wildlife habitat associated with wetland/riparian features not protected by other resource stipulations.

Invasive Species: Road density is a relative measure of the risk of noxious weeds because many weeds are spread through vehicle traffic (Bergquist 2007). Management of noxious weeds would be similar through all alternatives but effective management would depend on the amount of treatment needed to control infestations. The risk of noxious weed infestation in Alternative A would be similar to all alternatives until travel management is completed. It is not known if control efforts would minimize impacts to special status species.

Special Status Species: In addition to the actions noted above, specific management actions and impacts for special status species categories are described below:

Threatened and Endangered Species

Whooping Crane:* Alternative A does not provide specific guidance or management actions for whooping cranes.

Piping Plover: Under Alternative A, an NSO lease stipulation would be implemented within 1/4 mile of essential piping plover habitat to limit surface-disturbing activities. This would protect piping plover habitat and nesting activities in the planning areas should this species be found nesting on BLM-managed lands or minerals. Critical piping plover habitat has been designated below the Fort Randall Dam to the Nebraska border and the shores of Lake Oahe. Piping plovers would also be protected by NSO within 100 year floodplains.

Interior Least Tern: Under Alternative A, an NSO lease stipulation would be implemented within 1/4 mile of essential least tern habitat to limit surface-disturbing activities. This would protect least tern habitat and nesting activities in the planning areas should this species be found nesting on BLM-managed lands or minerals. No critical habitat has been designated for the interior least tern on the entire Missouri River and down the Cheyenne River is considered breeding habitat. Interior least terns would also be protected by an NSO lease stipulation within 100 year floodplains.

Allowing oil and gas leasing and development with an NSO lease stipulation within 1/2 mile of wetlands identified as least tern or piping plover habitat would minimize effects to those species such as direct and indirect habitat loss. Least terns are presently classified as a federally endangered species and piping plover are classified as a federally threatened species. USFWS has jurisdiction over federally listed threatened and endangered species. Consultation with the USFWS Ecological Services Section is required to identify threatened, endangered, or candidate species that may be present and to determine what additional protection and mitigation measures may be needed.

Oil and gas activities would be limited by standard lease terms. Activities near swift fox dens could be moved 200 meters or delayed for 60 days to protect reproductive activities associated with swift fox dens. Because the locations of dens are unpredictable and highly variable in the planning area, this stipulation would ensure protection of denning activities for all known dens on an annual basis.

Gray Wolf:* Alternative A does not provide specific guidance or management actions for gray wolves; this would be addressed at the project level.

Pallid Sturgeon:* Alternative A does not provide specific guidance or management actions for pallid sturgeon; this would be addressed at the project level.

Management decisions on the dispersed BLM parcels would likely have limited influence on these habitat areas, and recovery of a self-sustaining population would require restoration of the river flows, temperatures, turbidity and habitats in these main stem areas. Management decisions that improve habitat and water quality should have a beneficial impact on these species.

Topeka Shiner:* Alternative A does not provide specific guidance or management actions for Topeka shiner; this would be addressed at the project level. Management decisions that improve habitat and water quality would have a beneficial impact on this species.

Poweshiek skipperling:* Alternative A does not provide specific guidance or management actions for Poweshiek skipperling; this would be addressed at the project level. Management decisions that improve habitat and water quality would have a beneficial impact on this species.

American Burying Beetle:* Alternative A does not provide specific guidance or management actions for American burying beetle; this would be addressed at the project level.

*Scaleshell mussel**: Alternative A does not provide specific guidance or management actions for scaleshell mussel; this would be addressed at the project level. Management decisions that improve habitat and water quality would have a beneficial impact on this species.

Higgins eye (pearlymussel):* Alternative A does not provide specific guidance or management actions for Higgins eye; this would be addressed at the project level. Management decisions that improve habitat and water quality would have a beneficial impact on this species.

Candidate Species

Sprague's Pipit: Alternative A does not provide specific guidance or management actions for Sprague's pipit; this would be addressed at the project level.

Greater Sage-Grouse: Alternative A does not specifically require the BLM to develop standards for sage-grouse habitat, but states the BLM will use the National and South Dakota sage-grouse conservation strategies to address sage-grouse habitat at the project planning level.

Under Alternative A, a 1/4 mile NSO for oil and gas activity around sage-grouse leks would protect nesting habitat within that 1/4 mile. This NSO action would prohibit surface occupancy on 799 acres of BLM-administered surface and 2,767 acres of subsurface with high value for sage-grouse. This action would eliminate short-term direct impacts and long-term indirect impacts associated with oil and gas leasing in small areas around sage-grouse leks and would benefit all sagebrush-associated species located in those areas. A seasonal timing stipulation from March 1 to July 1 within 2 miles of sage-grouse lek sites for nesting and brood-rearing areas, affecting 46,139 acres of BLM surface (14 percent) and 138,437 acres of federal mineral estate. In addition, surface use would be prohibited from December 1 to March 31 within crucial winter range for sage-grouse. These management measures would reduce human presence and noise associated with equipment use during those timeframes and before development. Greater Sage-Grouse, as well as other wildlife and special status species, would be displaced after development. Power lines would not be required to be buried in important sage-grouse habitat areas, which could result in the potential for increased predation of sage-grouse from the creation of avian perches. However, surface disturbance and disruption in sage-grouse habitat areas beyond the proximity to leks would result in the loss of important habitat and disruption in behaviors such as nesting, brood rearing, and foraging for sage-grouse as well as for other species of wildlife.

Degradation of sagebrush habitat would continue in areas away from sage-grouse leks and would potentially have short-term and long-term direct and indirect impacts to sagebrush-associated birds, particularly in areas associated with high

densities of disturbances. Grazing management for rangeland health under Standards and Guidelines for all alternatives would benefit sagebrush-associated species. No actions in Alternative A would minimize habitat fragmentation and degradation, and impacts to sagebrush-associated species, including special status species, would continue to increase as incremental development of surface-disturbing and disruptive actions continues on BLM-managed lands.

Studies in South Dakota's range have determined that the sage-grouse in the planning area are considered non-migratory. This study also determined that this population spends 62 percent of its life within 2 miles of leks (Kaczor 2008, Swanson 2009). Other studies have quantified the distance from leks at which impacts of development become negligible and have also assessed the efficacy of the current BLM stipulation of NSO within 1/4 mile of a lek (USDI 1992, 1994, 2004). Impacts to leks from energy development were most severe near the lek, remained discernible out to distances more than 3.6 miles (Holloran 2005, Walker, et al. 2007a), and have resulted in the extirpation of leks within oil and gas fields (Holloran 2005, Walker, et al. 2007a). Holloran (2005) showed that lek counts decreased with distance to the nearest active drilling rig, producing well, or main haul road and that development influenced counts of displaying males to a distance of between 2.9 and 3.9 miles. All well-supported models in Walker, et al. (2007a) indicated a strong effect of energy development, estimated as proportion of development within either 1/2 mile or 2 miles on lek persistence. Buffer sizes of 0.25 mi., 0.5 mi., 0.6 mi. and 1.0 mi. result in an estimated lek persistence of 5 percent, 11 percent, 14 percent, and 30 percent. Lek persistence in the absence of coal bed natural gas development averages approximately 85 percent. Models with development at 4 miles had considerably less support, but the regression coefficient indicated that impacts were still apparent out to 4 miles. Tack (2009) found impacts of energy development on lek abundances (numbers of males per lek) out to 7.6 miles. Negative impacts would be anticipated from the 1/4 mile NSO management actions for leks in Alternative A, and would be greater than Alternatives B and C. The same effects to sage-grouse are anticipated from geophysical exploration and other energy or renewable energy development activities with the application of Alternative A.

Alternative A has a restriction on oil and gas activities in sage-grouse nesting areas by prohibiting drilling from March 1 to June 15. This mitigation would eliminate short-term direct disturbance and disruption on 46,139 acres of BLM-administered surface (19 percent) and 138,437 subsurface acres of sage-grouse nesting habitat. Direct effects would be mitigated by avoiding direct impacts to nesting habitats with the timing stipulation but indirect long-term effects would still be present from surface-disturbing and disruptive activities initiated outside the timing stipulation. This could lead to long-term declines in sage-grouse populations if well densities exceed thresholds for long-term disturbances. Well densities could exceed a threshold of approximately one well per mi^2 on approximately 30,388 acres of BLM-administered surface (12.5 percent) and 92,175 subsurface acres of sage-grouse habitat on BLM lands in the high potential areas under this alternative (See Table 4-40). This would result in an expected decrease in the populations of sage-grouse in all of these areas and depending on the exact configuration and density of well pads, could result in extirpation of sage-grouse from these areas.

Greater Sage-Grouse winter habitats are protected from surface-disturbing and disruptive activities through stipulations in place to protect this species' winter ranges. The seasonal timing stipulation for drilling activities on sage-grouse winter range is from December 1 to March 31. This mitigation would minimize short-term direct disturbance and disruption on 29,428 acres of BLM-administered surface (18.5 percent) and 65,906 subsurface acres of sage-grouse habitat. Direct effects would be mitigated by avoiding direct impacts to winter habitats on BLM lands with the timing stipulation, but indirect long-term effects would still be present from surface-disturbing and disruptive activities initiated outside the timing stipulation.

Wildfires that remove large tracts of big sagebrush could be detrimental to sage-grouse populations. Prescribed burns may also impact sage-grouse habitat but may also enhance some habitats if properly located. The small number of acres burned in Alternative A is probably not detrimental to sage-grouse habitat, and fuel buildup due to full suppression in grassland and sagebrush habitats does not accumulate from year to year; therefore, full suppression in big sagebrush habitats is beneficial for short-term and long-term persistence of sage-grouse habitat.

Livestock grazing could impact the suitability and extent of sage-grouse habitats in the planning area by altering habitat components. Failure to implement proper livestock grazing management could degrade sage-grouse habitats through removal of residual vegetation needed to minimize nest predation and transport of noxious weeds. A South Dakota sage-grouse study determined that 10.2 inches of grass height was the inflection point for 50 percent nest success (Kaczor 2008). Aside from transporting noxious weeds, the most impact to special status species and other wildlife habitats from livestock is anticipated in concentrated areas, such as water sources and riparian areas. Proper management of livestock grazing

through the implementation of Standards and Guidelines could minimize adverse impacts to sage-grouse or create beneficial impacts to sage-grouse by increasing forage production when managed to create diversity in vegetation at larger scales.

Alternative A does not provide specific guidance or management actions for the protection of priority habitat areas from habitat loss and fragmentation. Alternative A also does not include restrictions for the development of wind or other renewable energy in sage-grouse habitats.

Alternative A does not provide specific guidance or management actions for the noise or roads. Noise has an effect on habitat for numerous wildlife species including sage-grouse and associated sagebrush obligates.

Alternative A provides no specific guidance or management actions for noise and roads for sage-grouse. This would adversely impact sage-grouse which are known to select highly visible leks with good acoustic properties. Effects to sage-grouse would be a decrease in numbers of males on leks, lower activity levels and lower nest initiation near oil and gas development. Sage-grouse numbers on leks within one mile of coal bed natural gas compressor stations in Campbell County, Wyoming were consistently lower than on leks not affected by this disturbance (Braun, et al. 2002). It was determined that lek activity by sage-grouse decreased downwind of drilling activities, suggesting that noise had measurable negative impacts on sage-grouse (Holloran, et al. 2005).

Roads also generate noise, and Connelly, et al. (2004) indicated there were no active sage-grouse leks within 1.24 miles of Interstate 80 across southern Wyoming and only 9 leks were known to occur between 1.24 and 2.48 miles of Interstate 80. All leks but one that were located within 1/2 mile or less of major state and county highways in Butte County, South Dakota have been abandoned. Lyon and Anderson (2003) reported that oil and gas development influenced the rate of nest initiation of sage-grouse in excess of 1.86 miles of construction activities. Clearly, the amount and frequency of noise associated with development has major effects on sage-grouse. The actual level of noise (measured in decibels) that would not affect sage-grouse breeding and nesting activities is presently unknown.

Effects to sage-grouse and sagebrush habitats from overhead and buried power lines include collisions and habitat fragmentation (direct and indirect) and there is no specific guidance or management action in Alternative A. Burial of power lines would reduce some of the effects listed above.

Overall, surface disturbance in sagebrush habitats under Alternative A would adversely impact sage-grouse. Surface-disturbing and disruptive activities under Alternative A would result in long-term negative impacts to sage-grouse and other sagebrush-associated species in the planning area and would be greater than in Alternatives B and C.

Black-Footed Ferret: Alternative A does not provide specific guidance or management actions for black-footed ferrets; this would be addressed at the project level.

Dakota Skipper:* Alternative A does not provide specific guidance or management actions for Dakota skipper; this would be addressed at the project level.

***The whooping crane, gray wolf, pallid sturgeon, Topeka Shiner, Poweshiek skipperling, American burying beetle, Dakota skipper, scaleshell mussel, and Higgins eye mussel** have a low probability of occurring on BLM-administered surface and/or minerals. Management actions in this RMP would have minimal effect on these species as those actions described would occur on an extremely limited amount of habitat associated with these species. Throughout the life of the RMP, additional information would be considered as it becomes available and impacts to these species would be assessed at the project level.*

Sensitive Species

Black-Tailed Prairie Dog: Management of black-tailed prairie dogs is difficult on BLM-administered lands as most prairie dog towns occur on a mixture of public and private land. In 2009, 44 black-tailed prairie dog towns totaling 1,978 acres were found on BLM-administered surface estate and extending onto adjacent private, state, or other federal lands. Only four of these prairie dog towns occur on BLM-administered lands only.

Under Alternative A, BLM may reduce or eradicate some prairie dog towns that may be isolated or adjoining private lands when there are significant adverse impacts to soil or vegetation on public lands or when adjoining affected landowners have

entered into an agreement that the public lands could be controlled with their private lands after project level planning has been completed. Alternative A has no limits on the amount of control efforts that could take place on prairie dog towns.

When control efforts are scheduled on a prairie dog town that includes state and private land, a cooperative effort would be made to control the entire town. The cost of control for state and private land would be the responsibility of the private landowner or the state land permittee.

Prairie dog reduction methods may include using EPA-registered toxicants or nontoxic methods for prairie dog control (i.e., barriers, water, vegetation enhancement, prairie dog sterilization, biological control, etc.).

Swift Fox: Alternative A does not provide specific guidance or management actions for swift fox.

Birds

Game Birds: Other than sage-grouse, there are no special status game bird species. The effects to game birds (except sage-grouse) are discussed in the game bird portion of the Wildlife section.

Waterfowl: Alternative A does not provide specific guidance or management actions for sensitive waterfowl. Waterfowl species are impacted by other biological resource management actions, particularly those pertaining to water, riparian and wetland habitats. Under Alternative A, actions associated with residual vegetation and wetland habitat would also benefit a number of other waterfowl as well. Restrictions associated with water, riparian and wetland habitats would minimize short-term direct disturbance and disruption on 13,397 acres of BLM-administered surface (5 percent) and 63,426 acres of BLM mineral estate.

Raptors: Under Alternative A, an NSO lease stipulation would restrict surface-disturbing and disruptive impacts within one mile of peregrine falcon nests and within 1/2 mile of bald eagle which have been active within the last five years. Other sensitive raptor species have an NSO stipulation 1/2 mile of the nest site which has been active within the last seven years. Long-term direct and indirect effects to reproductive success of the raptors would be minimized from oil and gas activities.

Additionally, nest construction on power line posts interferes with power line operation and endangers raptors and their young. Burial of power lines would reduce effects such as those listed above.

Migratory Birds: Because of the diversity of special status migratory bird species and habitat requirements, the descriptions of impacts are categorized under the following habitats: forest and woodland species, sagebrush species, grassland species, and riparian and wetland species.

Forest and Woodland Species: BLM actions for silviculture treatments, forest products, and wildfire control result in short-term disturbance. Because of their diverse habitat requirements, some special status migratory birds are adversely impacted and some benefit from these management actions. Alternative A would provide greater amounts of these treatments and would benefit migratory birds associated with early successional habitats.

Sagebrush Species: Species that utilize or depend on sagebrush habitats benefit from management actions for sage-grouse as discussed above. NSO for 1/4 mile for sage-grouse leks would prohibit surface occupancy on 799 acres of BLM-administered surface and 2,767 acres of subsurface. This action would eliminate short-term direct impacts and long-term indirect impacts associated with oil and gas leasing in some of the sagebrush habitat in the planning area and would be beneficial for all sagebrush-associated species. Alternative A also provides for a TL within two miles of sage-grouse leks and within all sage-grouse nesting habitat. This action would restrict surface occupancy to 46,139 acres of BLM-administered surface and 138,437 acres of subsurface with nesting and brood-rearing habitat for sage-grouse. Both actions would also benefit sagebrush-associated birds by avoiding short-term direct impacts and long-term indirect impacts in these areas.

Grassland Species: Under Alternative A, grassland-associated migratory birds would be protected by limits on surface-disturbing and disruptive activities in leks, raptor nest sites or other biological resource management actions through an NSO, CSU and TL stipulations on grassland habitat associated with species such as sage-grouse. There are no stipulations specific to grassland-associated birds except in the Fort Meade ACEC where residual vegetation is to be

maintained at 8 to 12 inches on 50 percent or more of the area. The loss to long-term disturbance and associated avoidance would result in declines in bird populations, particularly in the high oil and gas development potential areas.

Grassland-associated special status migratory birds are impacted by changes to vegetation diversity, both in species composition and structure. Diversity in grasslands throughout the planning area would provide habitat for the entire group of special status species. The major disturbing and disruptive activities that alter diversity in the planning area include oil and gas activity or renewable energy. Grazing management for rangeland health under Standards and Guidelines for Alternative A would benefit grassland-associated species.

The impacts of disruptive activities on special status migratory birds occur primarily during the breeding period in all general habitat types noted above. In the planning area this generally applies to activities occurring from April 15 to July 15. Restrictions on disruptive activities specifically noted for piping plovers and least terns are NSO within 1/4 mile of nesting areas. Under Alternative A, an NSO restriction exists within a 1/2 mile buffer of the nests of bald eagles and other special status and sensitive raptors, within 1 mile of peregrine falcon nests, and within 1/4 mile of sage-grouse leks and other prairie grouse leks. Timing restrictions for these species during the breeding and nesting periods are from March 1 to June 30 for sage-grouse, and March 1 to June 15 for prairie grouse. There is a TL from March 1 to July 31 for weed treatments around raptor nests, but none for oil and gas or other surface-disturbing or disruptive activities in Alternative A. Detrimental impacts could occur to all species of migratory birds across the planning area where these other restrictions on disturbing and disruptive activities for other resources do not provide protection.

Riparian and Wetland Species: Although Alternative A has no specific management actions for migratory birds that use riparian and wetland areas, these species are impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats such as NSO for floodplains covering riparian areas, some wetlands, and other associated habitats. This action would prohibit surface occupancy to 13,397 acres of BLM-administered surface and 63,426 acres of subsurface. Under Alternative A, this would be a benefit to most riparian and wetland-associated species. Actions associated with riparian and wetland habitat would also benefit a number of wetland-associated migratory birds.

Fish: Although Alternative A does not provide specific guidance or management actions for sensitive species fish, and only the longnose sucker may occur on BLM lands and may benefit from the restrictions discussed in the riparian and wetland section above, these species could benefit from inventories to determine presence. Management actions that improve habitat and water quality should have a beneficial effect on these species.

Maintaining riparian areas or prairie stream fishery resources in PFC (Standards for Rangeland Health) ensures maintenance of, or improvement toward, high quality overall riparian habitat conditions.

The banded killifish, blacknose shiner, blue sucker; northern redbelly dace, finescale dace hybrid or northern redbelly dace x finescale dace hybrid; pearl dace, sicklefin chub and sturgeon chub species all occur in portions of the planning area, but are not known to occur on BLM lands or are only marginally affected by BLM management. In addition, surface occupancy and use would be prohibited within 1/4 mile of designated reservoirs with fisheries, affecting 551 acres of BLM-administered surface (less than 1 percent) and 12,548 acres of federal mineral estate.

The longnose sucker species exists in the Whitewood and Spearfish Creek watersheds and could be found in many of the clear, cold watersheds in the Black Hills. It could also be found in portions of Whitewood Creek that traverse the Exemption Area near Lead and Deadwood.

Reptiles and Amphibians: No specific management actions related to reptiles and amphibians are presented in Alternative A; this will be addressed at the project level. However, as noted above, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial for reptiles and amphibians. Management actions and allowable uses that protect water quality and quantity and riparian habitats are particularly beneficial for amphibians.

Insects: No specific management actions related to insects are presented in the Alternative A; this will be addressed at the project level. However, as noted above, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial for insects.

Plants: No specific guidance or management actions related to special status plants are presented in Alternative A; this will be addressed at the project level. However, management actions and allowable uses which restrict or mitigate the effects of surface disturbances and disruptions, regardless of the resource the action applies to, are generally beneficial for special status plants. Management actions and allowable uses that protect upland and riparian habitats are particularly beneficial for special status plants.

Aquatic and Fisheries Resources: Under Alternative A, oil and gas leasing would be prohibited within the floodplains of major rivers and on water bodies and streams, affecting 13,397 acres of BLM-administered surface (5 percent) and 63,426 acres of federal minerals. In addition, surface occupancy and use would be prohibited within 1/4 mile of designated reservoirs with fisheries, affecting 551 acres of BLM-administered surface (almost 2 percent) and 12,548 acres of federal mineral estate. Implementation of these management actions within the planning area would reduce habitat degradation and disturbance within critical water sources and riparian habitats from oil and gas activity. Special status species associated with these habitats within the planning area include migratory birds, bald eagle, piping plover, interior least-tern, waterfowl, and several species of reptiles and amphibians.

Visual Resources: Under Alternative A, VRM classes would be as follows: Class I (0 acres), Class II (1,229 acres), Class III (4,967 acres) and Class IV (530 acres). In this alternative, 266,704 acres are not designated as a VRM class. This alternative would allow for surface use and activities in VRM Class III and IV areas, and in some cases actions could be allowed in VRM Class II areas, if the contrasting visual elements from the actions can be minimized or eliminated. Therefore, special status species would potentially be affected by surface-disturbing and disruptive activities, human presence, the use of equipment, and noise disturbance in areas designated as VRM Class II, III, and IV.

Fire Management and Ecology, and Forest and Woodland Products: Alternative A would provide for 346 forested acres to be mechanically treated for forest health. An additional 213 acres would be treated with prescribed fire. This is approximately 1 percent of the roughly 17,500 acres of forested/woodland habitat managed by the BLM in the planning area. Short-term direct impacts to special status species from these treatments would be minimal because of the limited acreage involved in treatments. Long-term indirect effects to special status species would be increased because of the increased risk of large wildfire due to the buildup of fuels, and the loss of early successional habitats favored by some species of wildlife. These treatments would provide diversity in these habitats and the effects would be beneficial for most wildlife species as long as treatments in sage habitats are designed to avoid long-term effects to sagebrush habitats.

Vegetative treatments such as wood product sales would affect wildlife habitats including special status species habitats in various ways. Vegetation treatments that alter tree species composition or stand structure for specific resource objectives or for commercial value would alter wildlife habitats immediately. This would improve habitat for some species, especially those that select more early-seral or open forest habitats, and would degrade habitats for others, especially those that prefer denser and structurally diverse habitats. These treatments may return forests to a condition closer to historic composition or a desired condition in the long term. Impacts would depend highly on species, habitat conditions before and after treatments, type of treatment, details of how each treatment is carried out, adjacent habitat types, and long-term management of each area after treatments. Implementation plans developed for specific actions would ensure effects to wildlife habitats from commercial or personal use from woodland products would be mitigated or ensure wildlife habitat conditions are improved.

Livestock Grazing and Vegetative Communities – Rangeland: Changes to rangeland vegetation would be similar across all alternatives. These changes are primarily derived from grazing on these habitats and current grazing management would be beneficial to wildlife by introducing large-scale diversity in grassland habitats. However, Alternative A does not specify a minimum rest period from grazing following any major disturbance to vegetative communities, which may not benefit some special status wildlife species in the short term; however, long-term goals to promote diversity in grassland habitats would be minimized with this management action as long as grazing within the disturbed areas does not impact soil resources and contribute to increased soil erosion.

Livestock grazing occurs throughout the planning area and has an effect on special status and other wildlife habitats. Management of BLM-administered lands to meet Standards and Guidelines and changes to grazing seasons and livestock numbers, if grazing was determined a causal factor for not meeting standards, would minimize effects to special status species and other wildlife habitats. Change in numbers and monitoring of allotments not meeting Standards for Rangeland Health would minimize the potential effects from livestock grazing which include the following:

- competition for forage, water, and space;
- habitat alteration;
- competition for grass and forbs for big game;
- impacts to bighorn sheep from domestic sheep and goat grazing because of potential for disease transmission;
- degradations to stream banks from compression, sloughing, and removal of vegetation, resulting in erosion;
- changes in plant species composition from overuse;
- potential loss of shrubs in riparian areas, leading to a decrease in nesting habitat for riparian songbirds and bank stability;
- appropriate levels of grazing, stimulating growth of some plant species and increasing succulents;
- overgrazing, which decreases range conditions;
- weed control to reduce weed spread and resultant impact to native plant communities;
- fences that create travel barriers, cause stress and energy loss, result in injury and death from entanglement, alter big game distribution, and create perches for predators;
- fences for control of livestock to reduce impacts on vegetation, streams, and thus wildlife; and
- water developments that expand the spatial and temporal range of where both big game and livestock can exist, creating more pressure on vegetation and competition with each other.

New water developments would allow increased use of an area by wildlife. New developments would provide previously unavailable watering sites for different wildlife species when livestock are not in the vicinity or conflicting with wildlife use of the area.

With regard to prescribed and wildfire, livestock grazing would lead to some invasion of nonnative species in the dry conifer and perennial grass types, and would increase tree density by limiting grass competition in the dry conifer type. Grazing also would reduce fine fuels that would affect the rate of spread and intensity of fire.

OHV Use and Travel Management Areas: OHV use is limited to existing roads and trails across the planning area except the Fort Meade ACEC which is limited to designated roads and trails. The impacts from OHV use on special status species are limited. Subsequent travel management planning will identify designated routes. This will be the same across all alternatives. Completing route-specific travel planning would minimize and mitigate effects to special status species and habitats with timing restrictions or other closures.

Lands and Realty

Rights-of-Way, Leases and Permits: Under Alternative A, the Fort Meade ACEC would be the only ROW exclusion area or designated ROW avoidance area (6,574 acres). Impacts from the construction of ROWs within special status species and other wildlife habitat would include short-term disruption and displacement of individuals and direct mortality to less mobile species. Long-term adverse impacts would include habitat loss and fragmentation. Within the Fort Meade ACEC designated corridors, Alternative A would require all new power transmission lines 33 KV or less to be buried; and power lines 33 to 69 KV would be buried if location allows. Those power line structures that would not be buried would create collision potential for all avian species and create raptor perches that adversely affect small game and non-game species.

Withdrawals: Under Alternative A, the Fort Meade and Fossil Cycad ACECs would continue to be withdrawn from mineral entry for locatable minerals and closed for oil and gas leasing. No other areas within the planning area would be withdrawn from mineral entry. The withdrawal action in the Fort Meade ACEC would protect important special status species and other wildlife habitat from minerals exploration, eliminate surface disturbance from activities, and minimize habitat fragmentation from ancillary facilities.

Land Tenure: Under Alternative A, land tenure adjustments are addressed on a case-by-case basis. The effects of land tenure on special status species would be beneficial through the consolidation and acquisition of lands that contain habitat and provided protection that would not be afforded by non-federal ownership.

Minerals

Fluid Minerals: Approximately 6,894 acres of BLM-administered surface lands and subsurface would be closed to oil and gas leasing under Alternative A to protect a variety of resource values, not just special status species and other

wildlife. An additional 236,680 acres of surface and 1,355,684 acres of subsurface would be available for leasing with an NSO, TL, CSU, or standard stipulations. These protections would give limited benefit to all wildlife species located in these areas by minimizing surface-disturbing activities and associated avoidance.

The responses of special status species and other wildlife to facilities and activities associated with oil and gas activities are complex but well documented (FSEIS 2008). Potential effects include fragmentation of habitat and noise and movement disturbance due to the exploration, construction, and operation of facilities and roads related to timing and nature of the disturbance, severity of the winter, species and habitat type present, physiological status of the animal, hunting pressure, and other disturbance factors. One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008).

Although stipulations may mitigate impacts at local scales, impacts to wildlife often happen at much larger scales. Large-scale impacts to wildlife and wildlife habitats are best described by the density of impacts on the landscape. Road effects are discussed in this section since most road development in the planning area is anticipated to be associated with renewable energy and oil and gas activities. Impacts to populations are often not immediate and may be manifested in population level responses a number of years after the initial disturbance.

Although some of the short-term effects to special status species habitat are mediated by reclamation, those reclaimed areas adjacent to, or surrounding long-term habitat disturbance do not necessarily result in reclaimed wildlife habitat. Many species often avoid areas of long-term surface disturbance and disruption resulting in long-term indirect effects. The avoidance or lower probability of use of habitats near surface-disturbing and disruptive activities creates indirect habitat losses. Loss of habitat, whether direct or indirect, can reduce populations via reduced survival, reduced reproduction, or emigration. Individuals pushed from habitats near disturbances will increase densities on remaining habitats, exposing populations to greater density-dependent effects (Sawyer, et al. 2005).

Effects from geophysical exploration include wildlife displacement, nest abandonment, or direct nest loss and overall habitat fragmentation to numerous wildlife species including special status species such as ground nesting birds that are protected by the Migratory Bird Treaty Act. The scale of development, location and implementation measures all influence the severity of impacts to wildlife habitat and species, including special status species. Application of a CSU, timing stipulations, and lease terms would provide some protection and mitigate a portion of the effects addressed above. Prohibiting coal and geophysical exploration and an NSO lease stipulation would mitigate all effects because no action would occur unless a waiver, exception, or modification is granted.

Solid Minerals and Mineral Materials: Effects to special status species habitats, including habitats for other wildlife, from locatable minerals actions such as bentonite mining and potential uranium development include loss and fragmentation of habitat (direct and indirect effects), as well as disturbances from noise and movement from the exploration, construction, and operation of facilities and roads.

Effects from mineral material sales actions to special status species habitat, including habitats for other wildlife, include direct habitat loss, and indirect effects include habitat fragmentation and avoidance. Implementation plans would be required which would ensure effects to habitats and species would be mitigated.

Renewable Energy: Limited information exists on solar and wind energy project effects to special status species and other wildlife habitats. Wind energy affects various bird and bat species in several ways including collisions with rotors, towers and power lines, electrocutions, avoidance of turbines and habitat in the project area, and indirect habitat loss from turbines, roads, power lines, and associated buildings. For example, prairie grouse species are affected by habitat fragmentation and have been observed avoiding leks near wind projects (Schwartz 2004). Concerns about wind turbine impacts to bats have become increasingly public. To analyze the effects of reasonably foreseeable wind energy development, the BLM analyzed the effects of a current wind energy farm proposal within the planning area. In summary this proposal would involve 220 wind turbines across 9,640 acres of BLM-administered public land, and produce 770 megawatts of electricity (refer to Renewable Energy Development scenario in this Chapter). Restrictions and stipulations under Alternative A would reduce this development to around 8,876 acres and 88 turbines (actual numbers may vary based on environmental review at the project level). Under Alternative A, short-term disturbance for this project is projected to be 924 acres and long-term disturbance would be 231 acres. Surface-disturbing actions associated with the construction of this wind energy proposal would include the creation of new roads, increased soil erosion, and vegetation loss from the construction of wind turbines and power lines.

The impacts of this wind energy proposal would mainly depend on the type of special status species habitat it is located within. The proposal would likely be located within grassland or shrub steppe habitats. In general, impacts to special status species habitat and populations would be greatest and result in impacts to habitat and populations when the project is located in areas with high value to wildlife, such as wintering areas, nesting areas, grouse leks, staging areas, and migration stopovers or corridors. Project impacts would be greatest in areas of intact habitat in the planning area, where development would result in habitat degradation, loss or fragmentation. This would particularly impact areas that have special status species that are sensitive to habitat fragmentation, areas identified as critical to the recovery of a listed species, an expansion area of a recovering species, or core population areas. Impacts to special status species from wind energy developments located away from areas of high values for special status species would minimize impacts to priority wildlife species in the planning area.

Special Designations: All current ACECs would be retained. Short-term and long-term impacts would be beneficial for special status species within these ACECs by minimizing short-term and long-term direct and indirect effects from surface-disturbing and disruptive activities to special status species found within those ACECs. Closing the areas to oil and gas leasing and commercial renewable energy in current ACECs would increase the benefits for the special status species resources.

Impacts under Alternative B

Water Resources: Alternative B would include more restrictions to protect watershed conditions, thereby resulting in greater benefits to special status species than Alternative A. Surface-disturbing and disruptive activities within floodplains and wetland/riparian areas would be prohibited for oil and gas development and would be an avoidance area for renewable energy and ROW activity. This would provide some protection of surface water from impacts associated with soil erosion and runoff from disturbed areas and from actions related to fluid mineral development, renewable energy and ROW activities. Restrictions under Alternative B would protect approximately 30,169 acres of BLM-administered surface (11 percent) and 146,169 acres of federal mineral estate within floodplains and wetland/riparian areas, which would maintain or improve special status species habitat associated with floodplains and riparian habitat in the planning area, including waterfowl, riparian and wetland species and numerous species of reptiles and amphibians.

However, under this alternative, other surface-disturbing and disruptive activities could be allowed from other activities such as range improvements and facilities. These activities could reduce watershed conditions and, therefore, negatively impact special status species habitats. Impacts could also result in increased habitat fragmentation, direct disturbance to wildlife, and both short-term and long-term impacts to habitat.

Soil Resources: Alternative B considers a CSU on surface-disturbing activities for soils with severe erosion hazard. This would mitigate impacts to soil resources on approximately 57,971 acres in the planning area (See Table 4-26 for soils-related restrictions) and would be beneficial for special status species in the planning area by minimizing short-term direct impacts and long-term indirect impacts to special status species habitat associated with these soil features.

Under Alternative B, the estimated short-term disturbance from all surface-disturbing activities is 2,174 acres. Approximately 1,849 acres would be reclaimed, resulting in 325 acres of long-term surface disturbance from all surface-disturbing activities in Alternative B.

Vegetative Communities: Alternative B would provide for approximately 400 forested acres to be mechanically treated annually to improve forest health, which is less than Alternatives A and C, and an additional 1,000 acres would be treated annually by prescribed burning which is more than Alternative A and less than Alternative C. Short-term direct impacts to special status species and other wildlife from these treatments could be severe in treated areas. Long-term indirect effects to special status species and other wildlife would be beneficial because of the decreased risk of large wildfire and an increase of early successional habitats favored by some species of wildlife. Long-term indirect effects would be beneficial to most special status species provided there is careful planning for burns in sagebrush habitats to avoid impacting the integrity of sagebrush habitats.

Under this alternative, rangeland uplands and riparian areas would continue to be maintained or improved to meet PFC, and vegetation treatments would be used to achieve desired plant communities. This would result in localized, short-term

impacts to individuals, but in the long term would result in beneficial impacts to special status species and other wildlife habitat by increasing cover.

Vegetative Communities – Riparian and Wetlands: Alternative B does provide some protection of riparian habitat from impacts associated with soil erosion and runoff from disturbed areas and from other actions with an NSO lease stipulation for floodplains and associated riparian habitats. This would mitigate short-term direct and long-term indirect impacts to 30,169 acres of BLM-administered surface and 146,169 subsurface acres of wildlife habitat associated with wetland/riparian features not protected by other resource stipulations.

Noxious Weeds and Other Non-Native Invasive Species: To minimize the effects and disturbance by invasive species, only spot treatments using IPM methods would occur in suitable sage-grouse nesting habitat within three miles of known sage-grouse leks from March 1 to June 30. To minimize the disturbance by treating invasive species within raptor nesting buffers, treatments would not occur within 1/4 mile of all raptor nests, including bald and golden eagles, from March 1 to August 1 except weed treatments may be possible following consultation with the specialist for timing of least impact. This alternative is more restrictive than Alternative A and less restrictive than Alternative C. This alternative could limit the effectiveness of controlling noxious weeds and other non-native invasive species.

Wildlife

Special Status Species: Alternative B would provide a number of stipulations to minimize disturbance impacts from oil and gas activities at local scales through stipulations limiting timing or distance from key special status species resource values. Lands within the planning area will be an avoidance area for renewable energy development and other ROWs. These are addressed below under each special status species category. The acreage figures are not additive as some resource values overlap.

In addition to the actions noted above, specific management actions and impacts for special status species categories are described below.

Threatened and Endangered Species

Whooping Crane:* Alternative B does not provide specific guidance or management actions for whooping cranes.

Piping Plover: Under Alternative B, lands within 1/4 mile of essential piping plover habitat would be NSO for oil and gas activities. This would provide long-term protection for nesting habitat and long-term protection from disruptions within 1/4 mile of nesting habitats during the breeding season should this species be found nesting on BLM-managed lands or minerals. Critical piping plover habitat has been designated below the Fort Randall Dam to the Nebraska border and the shores of Lake Oahe. Piping plovers would also be protected by NSO within floodplains (30,169 acres of BLM-administered surface and 146,169 acres of BLM minerals).

Least Tern: Under Alternative B, lands within 1/4 mile of essential least tern habitat would be NSO for oil and gas activities. This would provide long-term protection for nesting habitat and long-term protection from disruptions within 1/4 mile of nesting habitats during the breeding season should this species be found nesting on BLM-managed lands or minerals. Non-critical habitat has been designated for the interior least tern; the entire Missouri River and the Cheyenne River is considered breeding habitat. Interior least terns would also be protected by NSO within floodplains (30,169 acres of BLM-administered surface and 146,169 acres of BLM minerals).

The least terns are presently classified as a federally endangered species and piping plover are classified as a federally threatened species. The USFWS has jurisdiction over federally listed threatened and endangered species. Consultation with the USFWS Ecological Services Section is required to identify threatened, endangered, or candidate species that may be present and to determine what additional protection and mitigation measures may be needed.

Black-footed Ferret: Alternative B does not provide specific guidance or management actions for black-footed ferrets; this will be addressed at the project level. Not considering prairie dog reintroductions on public land could have a negative impact.

Gray Wolf:* Alternative B does not provide specific guidance or management actions for gray wolves; this will be addressed at the project level.

Pallid Sturgeon:* Alternative B does not provide specific guidance or management actions for pallid sturgeon; this will be addressed at the project level. Management actions that improve habitat and water quality should have a beneficial impact on this species.

Topeka Shiner:* Alternative B does not provide specific guidance or management actions for Topeka shiner; this will be addressed at the project level. Management actions that improve habitat and water quality would have a beneficial impact on this species.

Poweshiek skipperling:* Alternative B does not provide specific guidance or management actions for Poweshiek skipperling; this would be addressed at the project level. Management decisions that improve habitat and water quality would have a beneficial impact on this species.

American Burying Beetle:* Alternative B does not provide specific guidance or management actions for American burying beetle; this will be addressed at the project level.

*Scaleshell mussel**: Alternative B does not provide specific guidance or management actions for scaleshell mussel; this would be addressed at the project level. Management actions that improve habitat and water quality would have a beneficial impact on this species.

Higgins eye (pearlymussel):* Alternative B does not provide specific guidance or management actions for Higgins eye; this would be addressed at the project level. Management actions that improve habitat and water quality would have a beneficial impact on this species.

Candidate Species

Sprague's Pipit: This grassland bird was recently determined to be a candidate species. No specific management actions are developed but new direction and restrictions could be applied. Protection would be given by actions associated with other species such as sage-grouse, sharp-tailed grouse and greater prairie-chicken. Alternative B does not provide specific guidance or management actions for Sprague's pipit, but as guidance becomes available it will be incorporated into management decisions. There is a need for occurrence potential and inventories will need to be conducted on potential projects within habitats; this will be addressed at the project level.

Greater Sage-Grouse: Alternative B proposes management actions to conserve priority habitat areas for sage-grouse. Alternative B would provide more protection than Alternative A, since sage-grouse habitat areas would have restrictions applied not just around the lek as presented under Alternative A. Management of priority areas for sage-grouse would minimize adverse impacts from habitat fragmentation and would reduce short-term direct impacts and long-term indirect impacts from disturbances and disruptions. Conservation of these priority areas would benefit other special status species and wildlife, especially grassland and sagebrush bird species occurring in the area.

Alternative B would require the BLM to use the national and South Dakota sage-grouse conservation strategies as standards in the planning area except for habitat standards which would be derived from regional standards. Regional standards for sage-grouse habitat would be cooperatively developed from recent habitat inventories and population parameters in the planning area along with relevant range-wide research findings.

Management under Alternative B would also emphasize protection of lek areas outside PPAs (509 BLM-administered surface acres and 2,072 BLM mineral acres), nesting and brood-rearing areas (14,749 BLM-administered surface acres and 31,522 BLM mineral acres), and wintering areas (50,791 BLM-administered surface acres and 103,553 BLM mineral acres).

Under Alternative B, 84,384 BLM-administered surface acres and 253,357 BLM mineral acres of sage-grouse habitat would be managed as PPAs to minimize surface-disturbing and other activities. This priority habitat area would be managed to maintain sage-grouse habitat by limiting surface-disturbing and disruptive activities. These PPAs would be NSO for oil and gas activities and an avoidance area for renewable energy development and ROWs. The impacts of habitat

loss and fragmentation would be less under Alternative B than Alternative A. These areas being avoidance areas for renewable energy development and ROWs would only limit the impacts. Management of priority areas for sage-grouse minimizes the adverse impacts of habitat fragmentation and minimizes short-term direct impacts and long-term indirect impacts from disturbances. Conservation of these priority areas is expected to benefit many other wildlife species occurring there such as grassland birds.

The remainder of the sage-grouse habitat in South Dakota would be managed as GHAs. These areas would be managed to protect the breeding activities at leks from long-term direct impacts, but would only minimize impacts to nesting and brood-rearing habitat located outside the 1/2 mile limit from short-term direct and long-term indirect impacts.

A 1/2 mile NSO for oil and gas activity around sage-grouse leks would also protect the nesting habitat within that area. This action would prohibit surface occupancy on 509 acres of BLM-administered surface and 2,072 acres of subsurface with high value for sage-grouse. This action would eliminate short-term direct impacts and long-term indirect impacts associated with oil and gas leasing in areas around sage-grouse leks and would benefit all sagebrush-associated species located in those areas. Degradation of sagebrush habitat could continue in areas outside of 1/2 mile from sage-grouse leks and would potentially have short-term and long-term direct and indirect impacts to sagebrush-associated birds, particularly in areas associated with high densities of disturbances. Recent research in South Dakota showed that 68 percent of the sage-grouse nested within 1.86 miles of an active lek, 79 percent nested within 3.1 miles of an active lek, and 97 percent nested within 4.35 miles of an active lek (Kaczor 2008). Alternative B provides more protection than the 1/4 mile buffer provided in Alternative A, but less protection than Alternatives C and D which provide a 1 mile NSO buffer around sage-grouse leks.

A timing restriction on oil and gas activities would be applied to sage-grouse winter range (50,791 BLM-administered surface acres and 103,553 BLM mineral acres) from December 1 to March 31. Also, a restriction for nesting and brood rearing areas (14,749 BLM-administered surface acres and 31,522 BLM mineral acres) from March 1 to July 15 within 3 miles of leks within the GHAs would minimize surface-disturbing and disruptive activities. This stipulation would minimize short-term impacts to sage-grouse on winter ranges and nesting and brood-rearing areas but would not address long-term indirect impacts to sage-grouse from activities that would occur outside the timing restriction. In contrast, Alternatives C and D provide more protection for sage-grouse by providing a four mile buffer around sage-grouse leks during nesting and brood-rearing periods in general habitat.

Greater Sage-Grouse are known to select highly visible leks with good acoustic properties. Effects to sage-grouse would be a decrease in numbers of males on leks and activity levels and lower nest initiation near oil and gas development. Sage-grouse numbers on leks within one mile of coal bed natural gas compressor stations in Campbell County, Wyoming were consistently lower than on leks not affected by this disturbance (Braun, et al. 2002). Holloran, et al. (2005) reported that lek activity by sage-grouse decreased downwind of drilling activities, suggesting that noise had measurable “negative” impacts on sage-grouse.

Roads also generate noise and Connelly, et al. (2004) indicated there were no active sage-grouse leks within 1.24 miles of Interstate 80 across southern Wyoming and only nine leks were known to occur between 1.24 and 2.48 miles of Interstate 80. All leks but one that were located within 1/2 mile or less of major state and county highways in Butte County, South Dakota have been abandoned. Lyon and Anderson (2003) reported that oil and gas development influenced the rate of nest initiation of sage-grouse in excess of 1.86 miles of construction activities. Clearly, the amount and frequency of noise associated with development has “major” effects on sage-grouse. Consequently, all drilling activities for gas and oil development should be prohibited within 3.3 miles of active leks and their associated nesting areas (Holloran 2005). Further, all existing and new compressor stations should add noise abatement devices (mufflers) to reduce audible noise within 3.3 miles of active leks. The actual level of noise (measured in decibels) that would not affect sage-grouse breeding and nesting activities is presently unknown.

The distribution and influence of multiple land uses such as energy development and livestock grazing also vary widely across the sage-grouse distribution (Knick, et al. 2003) and vary throughout the planning area. Conversion to croplands has eliminated or fragmented sagebrush in areas where there are deep fertile soils or irrigation potential. Oil and gas resources are being developed primarily in the southern portion of the sage-grouse range (Knick, et al. 2003, Naugle, et al. 2009) and exploration and development of wind or geothermal energy is increasing rapidly in many regions.

Livestock grazing occurs throughout the sage-grouse range and the planning area but has a more diffuse influence on soils and vegetation in contrast to land uses that remove or fragment habitat. A South Dakota sage-grouse study determined that

10.2 inches of grass height was the inflection point for 50 percent nest success (Kaczor 2008). Aside from transporting noxious weeds, the most impact to special status species and other wildlife habitats from livestock is anticipated in concentrated areas, such as water sources and riparian areas. Proper management of livestock grazing through the implementation of Standards and Guidelines could minimize adverse impacts to sage-grouse or create beneficial impacts to sage-grouse by increasing forage production when managed to create diversity in vegetation at larger scales.

In summary, in sage-grouse habitat:

Not authorizing above ground power or utility lines within one mile of sage-grouse leks and winter concentration areas or winter occurrence areas would minimize effects to sage-grouse and numerous other wildlife species such as electrocutions, collisions, predation and habitat fragmentation. A limited amount of habitat fragmentation, both direct and indirect, would still occur with the authorization of below ground power lines that would depend on reclamation practices.

Recent studies show that both direct and indirect effects can result from energy development. Prohibiting surface-disturbing or disruptive activities within 1/2 mile of sage-grouse leks except when the activity would not have a detrimental effect to sage-grouse habitat suitability would provide some protection for less than 28 percent of nesting sage-grouse (Kaczor 2008) and minimize effects such as direct and indirect habitat fragmentation. This alternative would not maintain the distribution and abundance of sage-grouse and would increase the likelihood of unsuccessful restoration following various activities such as energy development.

The effects from Alternative B would be similar to Alternative A, but would provide protection 1/2 mile from the perimeter of the lek. Additionally, the GHAs and PPAs area would be subject to noise limits in the conditions of approval.

It should be noted that median noise levels for rural areas likely range from 20-40 dBA in the morning and evening and from 50-60 dBA in the afternoon when wind speeds are typically the greatest (Final EA, DOE, Clipper Windpower EA, Wyo., 1/2005). Additional information from a noise study near Pinedale, Wyoming indicated mean noise levels near sage-grouse leks were between 24-32 dBA (PAPA 2009). Other BLM Record of Decision documents define baseline noise levels of 39 dBA based on settings similar to that of EPA's category of "Farm in Valley" (BLM Pinedale Anticline SEIS, ROD 2008).

The responses of special status species to facilities and activities associated with oil and gas activities are complex but well documented (FSEIS 2008). Potential effects include fragmentation of habitat, and noise and movement disturbance due to the exploration, construction, and operation of facilities and roads related to timing and nature of the disturbance, severity of the winter, species and habitat type present, physiological status of the animal, hunting pressure, and other disturbance factors. One of the greatest effects to special status species and other wildlife habitats include the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008). The responses to renewable energy are not as well documented but are expected to be similar.

The spread of noxious weeds has a potential impact to sage-grouse habitat on BLM lands in the planning area after surface-disturbing and disruptive activities as noted above. Noxious weeds contribute to loss of sage-grouse habitats, increase soil erosion, reduce water quantity and quality, and reduce structural and species diversity. The relative risk of noxious weed infestation between alternatives can be evaluated by the amount of roads anticipated by alternative. Alternative B has less risk of infestation when compared to Alternative A, but more than Alternative C through the NSO for oil and gas and avoidance of renewable energy and ROWs in a large portion of the planning area, and the resulting reduction in potential well pads and roads being constructed in habitats.

Burning can adversely impact nesting habitats due to the extensive time it takes for sagebrush canopy to recover. However, the number of acres burned in Alternative B is probably not detrimental to overall sage-grouse habitat in the planning area and full suppression in most sagebrush habitats is beneficial for short-term and long-term persistence of sage-grouse habitat through maintenance of large blocks of sagebrush habitats.

All new utility and power lines (overhead lines) within one mile of sage-grouse leks and wintering areas would be buried, eliminated, designed or sited in a manner which would not impact sage-grouse on BLM-administered land, provided the lines can be safely buried. These restrictions would improve habitat quality in areas near leks and wintering areas and would potentially enhance sage-grouse populations.

Effects to sage-grouse and sagebrush habitats from overhead power lines include collisions, and habitat fragmentation (direct and indirect) from overhead and buried power lines. Additionally, nest construction on power line posts interferes with power line operation and endangers raptors and their young. Avian species impacted include numerous migratory birds that are protected by the Migratory Bird Treaty Act. Burial of power lines would reduce effects.

Renewable energy is to be avoided or stipulated to mitigate impacts in the Greater Sage-Grouse PPAs, around leks and nesting and brood-rearing habit within the GHA. Developing minerals and wind-energy facilities on BLM-administered land under Alternative B could result in long-term adverse impacts to sage-grouse by destroying and fragmenting sagebrush habitats. These restrictions would limit the disturbance associated with wind and solar power generation in sage-grouse priority areas and where other resources conflict with wind energy development. Long-term and short-term impacts to sage-grouse from wind power under Alternative B are expected to be greater than Alternative C.

Other studies also have quantified the distance from leks at which impacts of development become negligible and have also assessed the efficacy of the current BLM stipulation of NSO within 0.25 miles of a lek (USDI 1992, 1994, 2004). Impacts to leks from energy development were most severe near the lek, remained discernible out to distances more than 3.6 miles (Holloran 2005, Walker et al. 2007a), and have resulted in the extirpation of leks within gas fields (Holloran 2005, Walker, et al. 2007a). Holloran (2005) showed that lek counts decreased with distance to the nearest active drilling rig, producing well, or main haul road and that development influenced counts of displaying males to a distance of between 2.9 and 3.9 miles. All well-supported models in Walker et al. (2007a) indicated a strong effect from energy development, estimated as proportion of development within either 0.5 miles or 2 miles, on lek persistence. Buffer sizes of 0.25 mi., 0.5 mi., 0.6 mi. and 1.0 mi. result in an estimated lek persistence of 5 percent, 11 percent, 14 percent, and 30 percent. Lek persistence in the absence of coalbed natural gas development averages approximately 85 percent. Models with development at 4 miles had considerably less support, but the regression coefficient indicated that impacts were still apparent out to 4 miles. Tack 2009 found impacts of energy development on lek abundances (numbers of males per lek) out to 7.6 miles. The same effects are expected to occur to sage-grouse from geophysical exploration and other energy development activities with the application of Alternative B.

Research done in South Dakota showed that sage-grouse spend 62 percent of their time within 2 miles of lek areas and they use this 2 mile area year round, so the two miles radius of habitat is very critical to this population (Kaczor 2008).

Impacts to leks located in the high and moderate oil and gas development potential areas would be similar to those described in Alternative A.

Overall, protection measures to minimize disturbances and protect habitat for sage-grouse under Alternative B would provide more short-term and long-term beneficial impacts to sage-grouse on BLM-managed lands than Alternative A but less than C.

Dakota Skipper:* Alternative B does not provide specific guidance or management actions for Dakota skipper; this will be addressed at the project level.

****The whooping crane, gray wolf, pallid sturgeon, Topeka Shiner, Poweshiek skipperling, American burying beetle, Dakota skipper, scaleshell mussel, and Higgins eye mussel*** *have a low probability of occurring on BLM-administered surface and/or minerals. Management actions in this RMP would have minimal effect on these species as those actions described would occur on an extremely limited amount of habitat associated with these species. Throughout the life of the RMP, additional information would be considered as it becomes available and impacts to these species would be assessed at the project level.*

Sensitive Species

Black-tailed Prairie Dog: Management for black-tailed prairie dogs is difficult as most prairie dog towns are located on a mixture of federal, private and state lands. In 2009, 44 black-tailed prairie dog towns totaling 1,978 acres were found on BLM-administered surface estate and extending onto adjacent private, state, or other federal lands. Only four of these prairie dog towns occur on BLM-administered lands only.

Black-tailed prairie dog colonies that occur entirely on public land would be managed for their wildlife and recreational values. The BLM may consider reduction or eradication of prairie dog colonies when there are significant adverse impacts

to soil, vegetation, or other resources, or threats to health and public safety on public lands or when adjoining affected landowners are controlling their private lands after project level planning has been completed. To limit the treatment acres, Alternative B limits the acreage of prairie dogs that could be eradicated to 15 percent of the total acres of prairie dogs on public lands, which currently means 296 acres could be treated annually if the project level planning approved it.

The reduction or eradication of up to 296 acres of black-tailed prairie towns would eliminate habitat for other wildlife species associated with that habitat by displacing them in future years. This action would kill up to 90+ percent of the black-tailed prairie dog population on the treated towns. In 2008 there were 339,114 acres of black-tailed prairie dogs on non-tribal lands including 67,372 acres on federal lands in South Dakota (Kempema 2009). The poisoning of 296 acres/year would affect 0.08 percent of the non-tribal acreage or 0.4 percent of the federal black-tailed prairie dog acres in the planning area. This would be minimal acreage on a planning areawide basis. In most cases, the treating of black-tailed prairie dog towns is only temporary with no follow-up treatments, and towns become reoccupied.

When poisoning is scheduled on a black-tailed prairie dog town which includes state and private land, a cooperative effort would be made to control the entire town. The cost of poisoning for state and private land would be the responsibility of the private landowner or the state land permittee.

Black-tailed prairie dog reduction methods may include using EPA-registered toxicants or nontoxic methods for prairie dog control (i.e., barriers, water, vegetation enhancement, prairie dog sterilization, biological control, etc.).

In Alternative B, no reintroduction of black-tailed prairie dogs would be considered on public lands so the growth of black-tailed prairie dog colonies would be only by natural increases.

Effects to black-tailed prairie dog colonies from allowing oil and gas and renewable energy development would include direct and indirect habitat loss from roads, pipelines, power lines, well pad construction, and noise from the construction or production of the facility. Mortality of prairie dogs is expected from construction activities, installation of infrastructure that may increase predation on prairie dogs by providing raptor perches, and increased access for recreational shooting. All of these impacts would be expected to decrease the density and abundance of prairie dogs within a colony, and potentially cause abandonment or displacement of the colony. The impacts from development facilitating the spread of plague are unknown. Disturbances on the periphery of colonies from pipeline ROWs and corridors may increase the ability of prairie dogs to occupy habitat within the disturbed areas, and possibly expand or redistribute the colony into these areas. Actions from development would be expected to affect the majority of those species associated with prairie dogs, including those listed as BLM sensitive species (i.e., burrowing owls, ferruginous hawks), largely depending on the tolerance of those species to disturbance.

Prohibiting surface-disturbing and disruptive activities for oil and gas and renewable energy development within 1/4 mile of burrowing owl nests, which occur in most black-tailed prairie dog colonies, would not be expected to directly affect prairie dog colonies. Some limited indirect effects may still occur to associated species from adjacent development, depending on the tolerance of those species to disturbance. This alternative would provide more protection for prairie dogs and other wildlife species associated with prairie dog colonies than Alternative A, but less than Alternative C.

Swift Fox: Under Alternative B oil and gas activities would be limited by standard lease terms. Activities near swift fox dens could be moved 200 meters or delayed for 60 days to protect reproductive activities associated with swift fox dens. Because the locations of dens are unpredictable and highly variable in the planning area, this stipulation would ensure protection of denning activities for all known dens on an annual basis.

Raptors: Under Alternative B, an NSO lease stipulation would restrict surface-disturbing and disruptive impacts within 1/4 mile of bald eagle nests, 1/2 mile of peregrine falcon nests, 1/4 mile for sensitive raptor nests, and 1/4 mile for other raptor species that have been active within the last seven years. This would result in 1,043 BLM-administered surface acres and 10,569 subsurface acres of habitat surrounding nests where long-term direct and indirect effects to reproductive success of the raptors would be minimized from oil and gas, renewable energy, and ROW activities.

Prohibiting surface-disturbing and disruptive activities and allowing oil, gas, and geothermal leasing with an NSO lease stipulation for nest sites would minimize potential physical harm, including death of eggs, young, or adults, alteration of habitats, and disruption of normal behavior of the various raptor species. This would also allow for compliance or mitigate potential losses or indirect impacts as addressed in the Migratory Bird Treaty Act under which all of the special status

raptors are protected. The seven-year time period would also minimize effects to territorial nest species such as the bald eagle and the ferruginous hawk, both of which can have multiple nests in a territory and may abandon a nest for more than two years and rebuild or reuse certain nest sites later.

Bats: All alternatives would utilize bat gates or other suitable structures to protect bat habitat and limit hazards associated with hazardous mine openings and caves. This would result in positive impact to bats over the long term for all alternatives.

American Dipper: Under all alternatives, all actions associated with water flows and quality in the Exemption Area would be evaluated to maintain American dipper habitat.

Fish: Alternative B does not provide specific guidance or management actions for sensitive fish species. As noted in Chapter 3, fisheries habitat on BLM surface estate is limited. The only sensitive status fish that commonly use fisheries on BLM lands is the longnose sucker. Management actions that improved habitat and water quality such as the American dipper would have a beneficial impact on these species. Implementation of BMPs and stipulations/restrictions in floodplains and sensitive soils would provide a long-term positive benefit to fish by reducing sediment loads and reducing adverse impacts to streamside vegetation and stream channels. Alternative B would provide greater benefits than Alternative A as more acres of riparian and fisheries habitat would be protected. Alternative B would provide slightly less protection than Alternatives C and D, as Alternative B would provide less protection through ROW restrictions.

Aquatic and Fisheries Resources: Under Alternative B, oil and gas leasing would be prohibited within the floodplains of major rivers, streams, and on water bodies, protecting 30,169 acres of BLM-administered surface and 146,169 acres of federal mineral estate. In addition, surface occupancy and use would be prohibited within 1/4 mile of designated reservoirs with fisheries (551 acres of BLM-administered surface and 12,548 acres of federal mineral estate). Implementation of these management actions within the planning area would reduce habitat degradation and disturbance within critical water sources and riparian habitats from oil and gas activity. Species associated with these habitats within the planning area include migratory birds, bald eagle, piping plover, interior least-tern, waterfowl, and several species of reptiles and amphibians.

Visual Resources: Under Alternative B, Visual resources would include VRM Class I (0 acres), VRM Class II (1,542 acres), VRM Class III (5,258 acres), and VRM Class IV (266,630 acres). In this alternative, a majority of the acreage falls within VRM Class IV areas. This alternative allows for the surface use and activities in VRM Class III and IV areas, and in some cases actions could be allowed in VRM Class II areas if the contrasting visual elements from the actions can be minimized or eliminated. Therefore, special status species along with other wildlife species would potentially be affected by surface disturbance, human presence, the use of equipment, and noise disturbance in areas designated as VRM Class II, III, and IV areas.

Fire Management and Ecology, and Forest and Woodland Products: Alternative B would provide for 400 forested acres to be mechanically treated for forest health. An additional 1,000 acres would be treated with prescribed burning. This is about six percent of the roughly 17,500 acres of forested/woodland habitat managed by the BLM in the planning area. Short-term direct impacts to special status species from these treatments may be severe in treated areas. Long-term indirect effects to most special status species would be beneficial because of the decreased risk of large wildfire and an increase of early successional habitats favored by some special status species. Long-term indirect effects would be beneficial to most special status species as long as there is careful planning for burns in sagebrush habitats to avoid impacting the integrity of the complete sage habitats.

Livestock Grazing and Vegetative Communities – Rangeland: Changes to rangeland vegetation would be similar across all alternatives. These changes are primarily derived from grazing on these habitats, and current grazing management would be beneficial to special status species by introducing large-scale diversity in grassland habitats. However, Alternative B specifies a minimum rest period from grazing following any major disturbance to vegetative communities, which would benefit some special status species in the short term; long-term goals to promote diversity in grassland habitats would increase with this management action as long as grazing within the disturbed areas does not impact soil resources and contribute to increased soil erosion.

Livestock grazing could be deferred up to one year before prescribed fire treatment and for a minimum of one growing season following treatment to promote vegetation recovery. Vegetative response after non-fire vegetative treatments,

prescribed fires or wildfires would depend highly on fire intensity, moisture or precipitation, and overall site conditions, or until the burned or treated areas attain identified vegetative objectives. This would assure high quality habitat conditions exist and would provide adequate forage, nesting and thermal cover for special status species and numerous other wildlife species.

Livestock grazing occurs throughout the planning area and has an effect on wildlife habitats including habitats for several special status species. Management of BLM-administered lands to meet Standards and Guidelines and changes to grazing seasons and livestock numbers if grazing was determined a causal factor for not meeting standards would minimize effects to wildlife habitats including special status species habitats. Change in numbers and monitoring of allotments not meeting Standards for Rangeland Health would minimize the potential effects from livestock grazing, which include the following:

- competition for forage, water, and space;
- habitat alteration;
- competition for grass and forbs for big game;
- impacts to bighorn sheep from domestic sheep and goat grazing because of potential for disease transmission;
- degradations to stream banks from compression, sloughing, and removal of vegetation, resulting in erosion;
- changes in plant species composition from overuse;
- potential loss of shrubs in riparian areas, leading to a decrease in nesting habitat for riparian songbirds and bank stability;
- appropriate levels of grazing, stimulating growth of some plant species and increasing succulents;
- overgrazing, which decreases range condition;
- weed control to reduce weed spread and resultant impact to native plant communities;
- fences that create travel barriers, cause stress and energy loss, result in injury and death from entanglement, alter big game distribution, and create perches for predators;
- fences for control of livestock to reduce impacts on vegetation, streams, and thus wildlife; and
- water developments that expand the spatial and temporal range of where both big game and livestock can exist, creating more pressure on vegetation and competition with each other.

New water developments would allow increased use of an area by wildlife. New developments would provide previously unavailable watering sites for different wildlife species when livestock are not in the vicinity or conflicting with wildlife use of the area.

With regard to prescribed and wildfire, livestock grazing would lead to an increased risk of invasion of nonnative species in the dry conifer and perennial grass types, and would increase tree density by limiting grass competition in the dry conifer type. Grazing also would reduce fine fuels which would affect the rate of spread and intensity of fire.

Recreation: Under Alternative B, two SRMAs (a total of 11,652 acres) would be designated and managed for recreation and visitor services including: the Fort Meade ACEC (6,574 acres) and the Exemption Area (5,078 acres). In addition, approximately 262,680 acres would be designated as an ERMA. The Fort Meade ACEC and the Exemption Area would be managed for Front Country Recreation Setting and the remaining planning area (except for the Fossil Cycad ACEC) would be managed for Middle Country. These recreation classes would provide for recreational opportunities, but limit the level and intensity of development and surface disturbance, thereby minimizing impacts and disturbance to special status species.

Special recreation permits would be required for any commercial, competitive, group use and/or vending activities in the planning area, allowing for opportunities to mitigate issues associated with special status species. Recreational gold panning could be allowed on all streams except in the Fort Meade ACEC and in the Fossil Cycad ACEC; however, gold panning could be restricted in this alternative if monitoring indicates impacts to resources. Under this alternative, snowmobile use would generally not be restricted in the planning area; however, if monitoring indicates resource damage or disruption to special status species and other wildlife is occurring, limitations could be addressed to minimize the impacts. Impacts to special status species from these management activities would include an increase human presence and noise creating short-term impacts to special status species and other wildlife and disturbance to behaviors such as breeding and foraging. Other adverse impacts include displacement and direct mortality from motorized use, including snowmobile use, increased trash, and human disturbance. Long-term impacts would include habitat loss with the development of permanent structures. Dispersed, casual and non-consumptive activities such as bird watching, hiking, walking, etc. would not be expected to adversely affect special status species or degrade habitat in the long term.

OHV Use and Travel Management Areas: OHV use is limited to existing roads and trails across the planning area except the Fort Meade ACEC which is limited to designated roads and trails. The impacts from OHV use on special status species are limited. Subsequent travel management planning will identify designated routes. This will be the same across all alternatives. Completing route-specific travel planning would minimize and mitigate effects to wildlife (including special status species) and habitats with timing restrictions or other closures.

Lands and Realty

Rights-of-Way, Leases and Permits: Under Alternative B, Greater Sage-Grouse PPAs would be managed as ROW and renewable energy avoidance areas, affecting 84,384 acres of BLM-administered surface. This would provide more protection to sage-grouse and sagebrush obligate and grassland species than in Alternative A by minimizing or eliminating habitat fragmentation and minimizing surface disturbance that could degrade important habitat. In this alternative, all fiber optic, telephone and power lines would be safely buried if possible, or sited to have the least impact on resources. This action would minimize the potential for predation; however, those power line structures that would not be buried would create collision potential for avian species and raptor perches that adversely affect special status species.

Impacts from the construction of ROWs within special status species habitat, but controlled within Greater Sage-Grouse PPAs, could be allowed but stipulated to mitigate impacts. Short-term disruption and displacement of individuals and direct mortality to less mobile species would still occur. Long-term adverse impacts would include habitat loss and fragmentation. In Alternative B, Fort Meade ACEC would have a designated ROW corridor. This would benefit special status species habitat by minimizing habitat fragmentation and the collision potential for avian species. Sixty-nine percent of the planning area, 189,153 BLM-administered surface acres, would be an avoidance area for renewable energy and ROWs. Special status species and other wildlife would be more negatively affected than in Alternative C. Actions not able to avoid areas would be stipulated to mitigate impacts. This would help minimize the short-term direct and long-term indirect impacts (refer to the Avoidance and Exclusion Summary in Appendix R).

Withdrawals: Under Alternative B, no areas would be recommended for withdrawal from mineral entry except the Fort Meade ACEC (6,574 acres) and Fossil Cycad ACEC (320 acres). The Fort Meade ACEC would be closed to oil and gas leasing. This would result in more impacts to special status species than in Alternative A. The Fossil Cycad ACEC and 410 acres of federal minerals within Bear Butte State Park would be open to oil and gas leasing with an NSO lease stipulation. Mineral development in important wildlife habitat areas such as the Fossil Cycad ACEC or Bear Butte State Park would result in habitat loss, surface disturbance, disruption and displacement due to disturbance from operation activities.

Land Tenure: Under Alternative B, land tenure adjustment categories would be established to direct land ownership proposals to consider at the project level. Only the Fort Meade ACEC and the Fossil Cycad ACEC are in Category 1 – Retention area with no disposal (6,894 surface acres). A majority of lands are in Category 2- Retention with Limited Disposal Potential based on specialist review (186,424 acres of BLM-administered surface) and the most available for disposal would be Category 3 – Disposal contingent on specialist review (86,578 acres). Important wildlife habitat and related resource values would be considered prior to all land exchanges or other disposals. Any acquisition of lands with high value vegetative or wildlife habitat would enhance wildlife species in the planning area. Lands that would be disposed of would meet the disposal criteria (see Appendix I) minimizing the loss and maximizing the gain for wildlife.

Minerals

Fluid Minerals: Approximately 6,574 acres of BLM surface lands and subsurface would be closed to oil and gas leasing under Alternative B. An additional 237,000 BLM-administered surface acres and 1,356,004 subsurface acres would be available for leasing with NSO, TL, CSU, and standard stipulations. These protections would benefit all wildlife species located in these areas by minimizing surface-disturbing activities and associated avoidance. The number of new wells on BLM-managed lands and mineral estate anticipated under Alternative B is 75 wells. Most of these wells (55) would be located in the high to moderate development potential areas.

The responses of special status species to facilities and activities associated with oil and gas activities are complex but well documented (FSEIS 2008). Potential effects include fragmentation of habitat, noise, movement, and disturbance due to the exploration, construction, and operation of facilities and roads related to timing and nature of the disturbance, severity of the winter, species and habitat type present, physiological status of the animal, hunting pressure, and other disturbance factors.

One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008).

Although stipulations may mitigate impacts at local scales, impacts to wildlife often happen at much larger scales. Large-scale impacts to special status species and their habitats are best described by the density of impacts on the landscape. Road effects are discussed in this section since most road development in the planning area is anticipated to be associated with renewable energy and oil and gas activities. Impacts to populations are often not immediate and may be manifest in population level responses a number of years after the initial disturbance.

Although some of the short-term effects to special status species habitat are mediated by reclamation, those reclaimed areas adjacent to, or surrounding long-term habitat disturbance do not necessarily result in reclaimed wildlife habitat. Many species often avoid areas of long-term surface disturbance and disruption resulting in long-term indirect effects. The avoidance or lower probability of use of habitats near surface-disturbing and disruptive activities creates indirect habitat losses. Loss of habitat, whether direct or indirect, can reduce populations via reduced survival, reduced reproduction, or emigration. Individuals pushed from habitats near disturbances will increase densities on remaining habitats, exposing populations to greater density-dependent effects (Sawyer, et al. 2005).

Effects from geophysical exploration include wildlife displacement, nest abandonment or direct nest loss and overall habitat fragmentation to numerous wildlife species, including special status species such as ground nesting birds that are protected by the Migratory Bird Treaty Act. The scale of development, location, and implementation measures all influence the severity of impacts to wildlife habitat and species, including special status species. Application of a CSU, timing stipulations, and lease terms would provide some protection and mitigate a portion of the effects addressed above. Prohibiting coal and geophysical exploration with an NSO lease stipulation would mitigate all effects because no action would occur unless a waiver, exception, or modification is granted.

Solid Minerals and Mineral Materials: Effects to wildlife habitats, including habitats for special status species, from locatable minerals actions such as bentonite mining and potential uranium development include loss and fragmentation of habitat (direct and indirect effects), as well as disturbances from noise and movement from the exploration, construction, and operation of facilities and roads.

Mineral material sales actions could directly impact wildlife habitats, including habitats for special status species, through habitat loss. Indirect effects could include habitat fragmentation and avoidance. Implementation plans would be required that would ensure effects to wildlife habitats and species would be mitigated.

Renewable Energy: Limited baseline data is available on special status species and other wildlife use in the planning area, so multi-year preconstruction wildlife studies will be required to confirm what wildlife activities are occurring on the proposed development sites. No development would be allowed within the proposed site unless the impacts to wildlife present can be mitigated. There could be an opportunity for off-site mitigation. To minimize renewable energy risks to wildlife, the potential developer would be required to develop a plan with specific designs to mitigate impacts before permitting can be completed.

To minimize effects of renewable energy on sage-grouse and their habitats, PPAs would be an avoidance area from commercial renewable energy development. This would result in 84,384 acres of BLM-administered surface within PPAs and other areas with sagebrush habitat in Butte and Harding counties being an avoidance area for renewable energy development.

Wind energy affects various bird and bat species in several ways including collisions with rotors, towers and power lines, electrocutions, avoidance of turbines and habitat in the project area, and indirect habitat loss from turbines, roads, power lines, and associated buildings. For example, prairie grouse species are affected by habitat fragmentation and have been observed avoiding leks near wind projects (Proceedings of the Wind energy and Birds/Bats, Resolve Inc., Washington D.C., S. Schwartz, Sept. 2004). The bat and wind turbine issue has also become increasingly public. For instance, a recent court ruling in West Virginia stopped the construction of numerous wind turbines because of the conclusion that the project would have wounded, harmed, or killed the Indiana bat. Information about the effects of solar and wind energy projects to wildlife habitats and species. Refer to Wind Wildlife Research Center Conference at http://www.nationalwind.org//issues/wildlife/researchmeetingviii.aspx).

Commercial wind energy development would be avoided within the Fort Meade and Fossil Cycad ACECs, within 1/2 mile of SRMAs, or within VRM Classes I and II. This would result in 11,652 acres of BLM-administered surface within these areas being an avoidance area for wind energy development, which would minimize impacts to special status species from the wind towers and associated structures affecting habitat and viewsheds.

To analyze the effects of reasonably foreseeable wind energy development, the BLM analyzed a wind energy proposal for 308 megawatts which would involve the construction of 73 wind turbines and leave a footprint on approximately 3,856 acres. Short-term disturbance for this project is projected to be 768 acres and long-term disturbance would be 192 acres. Surface-disturbing actions associated with the construction of this wind energy proposal would include the creation of new roads, increased soil erosion, and vegetation loss from the construction of wind turbines and power lines.

The development of wind energy projects within high value habitats for grassland birds would result in short-term and long-term population declines of the species through direct mortality from wind farm operations as well as indirect impacts through avoidance of the towers and other infrastructure (power lines, roads, buildings) and operation activities (vehicle traffic, human presence, and disturbance). Development within high value sage-grouse habitat would also result in short-term and long-term population declines of the species through direct mortality from wind farm operations as well indirect impacts through avoidance of the towers and other infrastructure, power lines, roads, buildings) and operation activities (vehicle traffic, human presence, and disturbance). Impacts could be particularly high for a population that spends 64 percent of the year within two miles of leks (Kaczor 2008, Swanson 2009).

The impacts of this wind energy proposal would mainly depend on the type of special status species habitat it is located within. The proposal would likely be located within grassland or shrub steppe habitats. In general, impacts to special status species habitat and populations would be greatest and result in impacts to habitat and populations when the project is located in areas with high value to wildlife, such as wintering areas, nesting areas, grouse leks, staging areas, and migration stopovers or corridors. Project impacts would be greatest in areas of intact habitat in the planning area, where development would result in habitat degradation, loss or fragmentation. This would particularly impact areas that have special status species sensitive to habitat fragmentation, areas identified as critical to the recovery of a listed species, an expansion area of a recovering species, or core population areas. Locating wind energy projects away from areas of high value for special status species would minimize impacts to priority wildlife species in the planning area.

Alternative B offers greater development potential than Alternative C, as the planning area would be an avoidance area versus an exclusion area in Alternative C.

Special Designations: All current ACECs (Fort Meade and Fossil Cycad) would be retained (6,894 acres). This would benefit special status species within these ACECs because short-term and long-term direct and indirect effects from surface-disturbing and disruptive activities would be minimized within those ACECs. Closing the Fort Meade ACEC (6,574 acres) to oil and gas leasing would increase the benefits for special status species. Opening the Fossil Cycad ACEC (320 acres) to oil and gas leasing with an NSO would decrease the benefits for special status species.

Impacts under Alternative C

Water Resources: Alternative C would provide more protection to water quality than Alternatives A or B by identifying more restrictions to surface occupancy and use. In this alternative, management actions would prohibit surface occupancy and use within areas of hydric soils, riparian areas, floodplains, lakes, ponds, rivers, water bodies, and streams. In addition, proposals for linear ROW crossings would be considered only if there is no other feasible crossing location, and would require off-site mitigation. This would provide protection of surface water from impacts associated with soil erosion and runoff from disturbed areas and from other actions, stabilize watershed conditions in areas with excessive erosion, and reduce habitat degradation and disturbance. These restrictions would provide the same protection as Alternative B, which is approximately 30,169 acres of BLM-administered land and 146,169 acres of subsurface federal minerals. This would result in improved wildlife habitat associated with floodplains and riparian habitat within the planning area, including waterfowl, riparian and wetland species and numerous species of reptiles and amphibians.

Soil Resources: Alternative C considers an NSO on surface-disturbing activities for soils with severe erosion hazard. This would mitigate impacts to soil resources on approximately 57,971 acres in the planning areas (see Table 4-26 for soils-

related restrictions) and would be beneficial for special status species in the planning area by minimizing short-term direct impacts and long-term indirect impacts to special status species habitat associated with these soil features.

Estimated short-term disturbance from all surface-disturbing activities is 1,651 acres. Approximately 1,936 acres would be reclaimed, resulting in 354 acres of long-term surface disturbance from all surface-disturbing activities in Alternative C.

Vegetative Communities: Impacts from management actions identified in Alternative C would be similar to Alternative B, except fewer acres of forested habitat (350 acres) would be mechanically treated annually for forest health. An additional 500 acres would be treated annually by prescribed burning. Short-term direct impacts to special status species from these treatments may be severe in treated areas. Other management actions to improve vegetative condition could result in localized, short-term impacts to individuals, but in the long term would result in beneficial impacts to special status species habitat by increasing vegetation for wildlife. Treatment of sagebrush habitat critical to antelope and sage-grouse would be evaluated at the project scale; but if allowed, could result in displacement of individuals and loss of breeding and brood-rearing habitats for sagebrush obligates.

Vegetative Communities – Riparian and Wetland: Alternative C would provide some protection of surface water from impacts associated with soil erosion and runoff from disturbed areas and from other actions through an NSO lease stipulation within 300 feet of streams, lakes, reservoirs, canals, and associated riparian habitats. This would mitigate short-term direct and long-term indirect impacts to 30,487 BLM-administered surface acres and 146,169 acres of mineral estate wildlife habitat associated with wetland/riparian features not protected by other resource stipulations.

Alternative C does provide some protection of riparian habitat from impacts associated with soil erosion and runoff from disturbed areas and from other actions with an NSO lease stipulation for floodplains associated riparian habitats. This would mitigate short-term direct and long-term indirect impacts to 30,169 acres of BLM-administered surface and 146,169 subsurface acres wildlife habitat associated with wetland/riparian features not protected by other resource stipulations, the same as Alternatives A and B.

Invasive Species: To minimize the effects and disturbance by invasive species, only spot treatments using IPM methods would occur in suitable sage-grouse nesting habitat within four miles of known sage-grouse leks from March 1 to July 15. Also, to minimize the disturbance from treating invasive species within raptor nesting buffers, treatments would not occur from March 1 to July 31 within 1/4 mile of raptor nesting sites active within the last seven years, including bald and golden eagles. These restrictions would protect approximately 4,095 acres of BLM-administered land from unlimited disruption. This alternative is more restrictive than Alternatives A and B and could limit the effectiveness of controlling noxious weeds and other non-native invasive species.

Wildlife

Special Status Species: Alternative C would provide the most stipulations to minimize disturbance impacts from oil and gas activities at local scales through stipulations limiting timing or distance from key special status species resource values. Restricted lands within the planning area would be excluded from renewable energy development and ROWs. These are addressed below under each special status species category. The acreage figures are not additive as some resource values overlap.

In addition to the actions noted above, specific management actions and impacts for special status species categories are described below:

Threatened and Endangered Species

Whooping Crane:* Alternative C does not provide specific guidance or management actions for whooping cranes.

Piping Plover: The effects would be the same as described in Alternative B.

Least Tern: The effects would be the same as described in Alternative B.

Black-footed Ferret: Alternative C does not provide specific guidance or management actions for black-footed ferrets.

Gray Wolf:* Alternative C does not provide specific guidance or management actions for gray wolves.

Pallid Sturgeon:* Alternative C does not provide specific guidance or management actions for pallid sturgeon. Management actions that improve habitat and water quality should have a beneficial impact on this species.

Topeka Shiner:* Alternative C does not provide specific guidance or management actions for Topeka shiner; this will be addressed at the project level. Management actions that improve habitat and water quality would have a beneficial impact on this species.

Poweshiek skipperling:* Alternative C does not provide specific guidance or management actions for Poweshiek skipperling; this would be addressed at the project level. Management actions that improve habitat and water quality would have a beneficial impact on this species.

American Burying Beetle:* Alternative C does not provide specific guidance or management actions for American burying beetle.

*Scaleshell mussel**: Alternative C does not provide specific guidance or management actions for scaleshell mussel; this would be addressed at the project level. Management actions that improve habitat and water quality would have a beneficial impact on this species.

Higgins eye (pearlymussel):* Alternative C does not provide specific guidance or management actions for Higgins eye; this would be addressed at the project level. Management actions that improve habitat and water quality would have a beneficial impact on this species.

Candidate Species

Sprague's Pipit: The effects would be the same as described in Alternative B.

Greater Sage-Grouse: Alternative C would require the BLM to use the national and South Dakota sage-grouse conservation strategies as standards in the planning area except for habitat standards which would be derived from regional standards. Regional standards for sage-grouse habitat would be cooperatively developed from recent habitat inventories and population parameters in the planning area along with relevant range-wide research findings. Management under Alternative C would also emphasize protection of lek areas and sagebrush areas that contribute to the distribution and connectivity of habitat patches. Alternative C would provide the most protection of BLM-administered lands in PPAs through a closure of oil and gas minerals, a withdrawal or closure of other types of minerals, and exclusion of all types of ROWs in the entire PPA.

Under Alternative C, priority sage-grouse habitat (96,379 acres of BLM-administered surface) would be managed as PPAs to minimize surface-disturbing and other activities. Alternative C also provides specific guidance or management actions for the protection of priority habitat areas from habitat loss and fragmentation. Large blocks of the priority habitat would be managed to maintain sage-grouse habitat by limiting surface-disturbing and disruptive activities and closing or recommending the withdrawal of these areas to mineral development, thereby reducing the impacts from habitat loss and fragmentation more under Alternative C than Alternative A or B. To some degree the positive impacts to sage-grouse as a result of the closure or withdrawal of minerals would be limited as many of the high to moderate oil and gas potential areas are already leased and producing and much of the high potential for bentonite production is already claimed. Any closure or withdrawal of minerals would need to honor these valid, existing rights and mineral development could continue in these claimed or producing areas even if they are within the PPAs or other types of important wildlife habitat.

The remainder of the sage-grouse habitat in South Dakota would be managed as GHAs to protect the breeding activities at leks from short-term and long-term direct impacts, but would not protect nesting and brood-rearing habitat located outside the one mile limit from long-term impacts. A one mile NSO around sage-grouse leks would protect leks and nesting habitat. Alternative C would prohibit and exclude surface occupancy on 767 acres of BLM-administered lands with high value for sage-grouse. This action would eliminate short-term direct impacts and lower long-term indirect impacts associated with oil and gas activities, renewable energy development and other ROWs in areas around sage-grouse leks, and would benefit all sagebrush-associated species located in those areas. Degradation of sagebrush habitat could continue in

areas farther than one mile from sage-grouse leks and would potentially have short-term and long-term direct and indirect impacts to sage-grouse and sagebrush-associated birds, particularly in areas associated with high densities of disturbances.

The NSO lease stipulation around leks would minimize disturbances and disruptions to breeding activities and avoid impacts to those birds nesting within that one mile distance. Recent research showed that 64 percent of the sage-grouse nested within 1.25 miles of an active lek, 68 percent nested within 1.86 miles of an active lek, 79 percent nested within 3.1 miles of an active lek, and 97 percent nested within 4.35 miles of an active lek (Kaczor 2008). Under Alternative C, less than 64 percent of the nesting sage-grouse would be protected.

A timing restriction on oil and gas activities would be applied to sage-grouse winter range from December 1 to March 31 and a restriction for nesting and brood rearing from March 1 to July 15 within four miles of leks to minimize disruptive activities that would result in increased mortality and disturbance. This stipulation would mitigate short-term impacts to sage-grouse on winter ranges and nesting and brood-rearing areas, but would not address long-term indirect impacts to sage-grouse from activities that would occur outside the timing restriction as local studies showed 62 percent of the time they were within 1.98 miles of lek sites (Swanson 2009).

Alternative C proposes management actions to conserve priority habitat areas for sage-grouse (96,379 surface acres and 289,563 subsurface acres) thus helping other wildlife such as migratory birds. Management of priority areas for sage-grouse minimizes the adverse impacts of habitat fragmentation, and also minimizes short-term direct and long-term indirect impacts from disturbances. Conservation of these priority areas is expected to benefit many other wildlife species occurring there such as grassland birds. Greater Sage-Grouse would receive protection through NSO requirements in sage-grouse winter range. Sage-grouse habitat would also be managed for succulent vegetation including a variety of forbs. These strategies would be applied locally and would not address large-scale impacts across the planning area.

The distribution and influence of multiple land uses such as energy development and livestock grazing also vary widely across the sage-grouse distribution (Knick, et al. 2003) and vary throughout the planning area. Conversion to croplands has eliminated or fragmented sagebrush in some areas with deeper fertile soils or irrigation potential. Oil and gas resources are being developed primarily in the southern portion of the sage-grouse range (Knick, et al. 2003; Naugle, et al. 2009) and exploration and development of wind or geothermal energy is increasing rapidly in many regions.

Livestock grazing occurs throughout the sage-grouse range and the planning area but has a more diffuse influence on soils and vegetation in contrast to land uses that remove or fragment habitat. BLM may suspend grazing on a temporary basis if Standards for Rangeland Health are not being met and changes to grazing practices have failed to meet standards or produce improvement.

Not authorizing above ground utility power lines (overhead lines) within two miles of sage-grouse leks and winter range would minimize effects to sage-grouse and numerous other wildlife species from electrocutions, collisions, predation, and habitat fragmentation. This may not apply to cases where overhead lines cannot be safely buried but in these cases, lines would be sited or designed to reduce impacts to sage-grouse. This two mile buffer would encompass more than 68 percent of all nesting sage-grouse near the lek. South Dakota studies showed 68 percent nested within 1.86 miles of an active lek, and 79 percent nested within 3.1 miles of an active lek (Kaczor 2008). A limited amount of habitat fragmentation, both direct and indirect, would still occur with the authorization of below ground power lines that would depend on reclamation practices.

Recent studies show that both direct and indirect effects can result from the effects of energy development. Prohibiting surface-disturbing or disruptive activities within one mile of sage-grouse leks except when the activity would not have a detrimental effect to sage-grouse habitat suitability would provide protection for around 60 percent of nesting sage-grouse and minimize effects such as direct and indirect habitat fragmentation. This alternative would not likely maintain the distribution and abundance of sage-grouse. The effects of Alternative C provide an additional 1/2 mile protection to one mile from the perimeter of the lek.

Noise has an effect on numerous wildlife species including sage-grouse and associated sagebrush obligates. Greater Sage-Grouse are known to select highly visible leks with good acoustic properties. Effects to sage-grouse would include a decrease in numbers of males on leks and activity levels and lower nest initiation near oil and gas development. Sage-grouse numbers on leks within one mile of coalbed natural gas compressor stations in Campbell County, Wyoming were consistently lower than on leks not affected by this disturbance (Braun, et al. 2002; Holloran, et al. 2005). It was reported

that lek activity by sage-grouse decreased downwind of drilling activities, suggesting that noise had measurable impacts on sage-grouse (Holloran, et al. 2005).

It should be noted that median noise levels for rural areas likely range from 20-40 dBA in the morning and evening and from 50-60 dBA in the afternoon when wind speeds are typically the greatest (Final EA, DOE, Clipper Windpower EA, Wyo., 1/2005). Additional information from a noise study near Pinedale, Wyoming indicated mean noise levels near sage-grouse leks were between 24-32 dBA (PAPA 2009). Other BLM Record of Decision documents define baseline noise levels of 39 dBA based on settings similar to that of EPA's category of "Farm in Valley" (BLM Pinedale Anticline SEIS, ROD 2008).

The responses of wildlife to facilities and activities associated with oil and gas development are complex but well documented (FSEIS 2008). Potential effects include fragmentation of habitat and noise and movement disturbance due to the exploration, construction, and operation of facilities and roads related to timing and nature of the disturbance, severity of the winter, species and habitat type present, physiological status of the animal, hunting pressure, and other disturbance factors. One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008).

Roads also generate noise and Connelly, et al. (2004) indicated there were no active sage-grouse leks within 1.24 miles of Interstate 80 across southern Wyoming, and only 9 leks were known to occur between 1.24 and 2.48 miles of Interstate 80. All leks but one that were located within 1/2 mile or less of major state and county highways in Butte County, South Dakota have been abandoned. Lyon and Anderson (2003) reported that oil and gas development influenced the rate of nest initiation of sage-grouse in excess of 1.86 miles from construction activities. Clearly, the amount and frequency of noise associated with development has "major" effects on sage-grouse. Consequently, all drilling activities for oil and gas development should be prohibited within 3.3 miles of active leks and their associated nesting areas (Holloran 2005). Further, all existing and new compressor stations should add noise abatement devices (mufflers) to reduce audible noise within 3.3 miles of active leks. Additionally, the GHA and PPA areas would be subject to noise limits in the conditions of approval.

The spread of noxious weeds has a potential impact to sage-grouse habitat on BLM lands in the planning area after surface-disturbing and disruptive activities as noted above. Noxious weeds contribute to loss of sage-grouse habitats, increase soil erosion, reduce water quantity and quality, and reduce structural and species diversity. The relative risk of noxious weed infestation between alternatives can be evaluated by the amount of ground disturbance anticipated by alternative. Alternative C has the least risk of infestation compared to the other alternatives through the NSO for oil and gas, renewable energy and ROWs in a large portion of the planning area, the resulting reduction in potential well pads and roads being constructed in habitats, and TL for weed spraying which limits the disturbance it could cause.

Alternative C would provide for approximately 500 acres of habitat treatment through prescribed fire in grassland and shrubland areas. Burning can adversely impact nesting habitats due to the extensive time it takes for sagebrush canopy to recover. However, the number of acres burned in Alternative C is probably not detrimental to overall sage-grouse habitat in the planning area, and full suppression in most sagebrush habitat is beneficial for short-term and long-term persistence of sage-grouse habitat through maintenance of large blocks of sagebrush habitat.

All Greater Sage-Grouse PPAs, leks, nesting and brood rearing, and wintering areas would be exclusion areas for renewable energy and other ROWs on BLM-administered land, which would improve habitat quality in these areas and could potentially enhance sage-grouse populations.

In summary, for sage-grouse habitat:

Effects to sage-grouse and sagebrush habitats from overhead power lines include collisions, predation and habitat fragmentation (direct and indirect). Other avian species impacted include numerous migratory birds that are protected by the Migratory Bird Treaty Act. Burial of power lines would reduce collisions and predation effects but would cause habitat fragmentation.

Wind and other renewable energy development is excluded in areas throughout the planning area in Alternative C and is specifically excluded in the Greater Sage-Grouse PPAs, GHA lek and nesting habitat areas, VRM Class II, SRMAs, and ACECs. Developing minerals and wind-energy facilities on BLM-administered land under Alternative C could result in

long-term adverse impacts to sage-grouse by destroying and fragmenting sagebrush habitats. These restrictions would avoid the disturbance and disruption associated with wind and solar power generation in sage-grouse priority areas. The long-term and short-term impacts to sage-grouse from wind energy development and other renewable energy on BLM-administered land under Alternative C would be less than Alternatives A or B. Even the most stringent stipulations on BLM lands/minerals is not enough to completely protect wildlife because development would be pushed onto private lands where the BLM has no input on activities.

Overall, protective measures under Alternative C to minimize disruption and disturbances and protect habitat for sage-grouse would provide more short-term and long-term beneficial impacts to sage-grouse on BLM-managed lands than Alternative B.

Other studies have quantified the distance from leks at which impacts of development become negligible and have also assessed the efficacy of the current BLM stipulation of NSO within 0.25 miles of a lek (USDI 1992, 1994, 2004). Impacts to leks from energy development were most severe near the lek, remained discernible out to distances more than 3.6 miles (Holloran 2005; Walker, et al. 2007a), and have resulted in the extirpation of leks within gas fields (Holloran 2005; Walker, et al. 2007a). Holloran (2005) showed that lek counts decreased with distance to the nearest active drilling rig, producing well, or main haul road, and that development influenced counts of displaying males to a distance of between 2.9 and 3.9 miles. All well-supported models in Walker, et al. (2007a) indicated a strong effect from energy development, estimated as proportion of development within either 0.5 mile or 2 miles, on lek persistence. Buffer sizes of 0.25 mi., 0.5 mi., 0.6 mi. and 1.0 mi. result in an estimated lek persistence of 5 percent, 11 percent, 14 percent, and 30 percent. Lek persistence in the absence of coalbed natural gas development averages approximately 85 percent. Models with development at 4 miles had considerably less support, but the regression coefficient indicated that impacts were still apparent out to 4 miles. Tack (2009) found impacts of energy development on lek abundances (numbers of males per lek) out to 7.6 miles. The same effects are expected to occur to sage-grouse from geophysical exploration and other energy development activities with the application of Alternative B.

Research that was done in South Dakota showed that sage-grouse spend 68 percent of their time within 2 miles of lek areas and they use this 2 mile area year round, so the two miles radius of habitat is extremely critical to this population (Kaczor 2008).

Dakota Skipper:* Alternative C does not provide specific guidance or management actions for Dakota skipper.

****The whooping crane, gray wolf, pallid sturgeon, Topeka Shiner, Poweshiek skipperling, American burying beetle, Dakota skipper, scaleshell mussel, and Higgins eye mussel** have a low probability of occurring on BLM-administered surface and/or minerals. Management actions in this RMP would have minimal effect on these species as those actions described would occur on an extremely limited amount of habitat associated with these species. Throughout the life of the RMP, additional information would be considered as it becomes available and impacts to these species would be assessed at the project level.*

Sensitive Species

Black-tailed Prairie Dog: Management for black-tailed prairie dogs is difficult as most prairie dog towns (colonies) are located on a mixture of federal, private and state lands. In 2009, 44 black-tailed prairie dog towns totaling 1,978 acres were found on BLM-administered surface estate and extending onto adjacent private, state, or other federal lands. Only four of these prairie dog towns occur on BLM-administered lands only.

Black-tailed prairie dog towns that occur entirely on public land would be managed for their wildlife and recreational values. The BLM may consider reduction or eradication to prairie dog colonies when there are significant adverse impacts to soil, vegetation, or other resources, or threats to health and public safety on public lands or when adjoining affected landowners are controlling their private lands after project level planning has been completed. To minimize the treatment acres, Alternative B limits the acreage of prairie dog towns that could be eradicated to 10 percent of the total acres of prairie dogs on public lands, which at this time means 198 acres could be treated annually if approved through project level planning.

This action would kill up to 90+ percent of the black-tailed prairie dog population on the treated towns. The reduction or eradication of up to 198 acres of black-tailed prairie dog towns would eliminate habitat for other wildlife species associated

with that habitat by displacing them in future years. In 2008 there were 339,114 acres of black-tailed prairie dogs on non-tribal lands, including 67,372 acres on federal lands in South Dakota (Kempema 2009). The poisoning of 198 acres/year would affect 0.06 percent of the non-tribal acreage or 0.3 percent of the federal black-tailed prairie dog acres in the planning area. This would be minimal acreage on a planning areawide basis. In most cases, the treatment of black-tailed prairie dog towns is only temporary with no follow up treatments, and towns become reoccupied.

When poisoning is scheduled on a black-tailed prairie dog town that includes state and private land, a cooperative effort would be made to control the entire town. The cost of poisoning for state and private land would be the responsibility of the private landowner or the state land permittee.

Black-tailed prairie dog reduction methods may include using EPA-registered toxicants or nontoxic methods for prairie dog control (i.e., barriers, water, vegetation enhancement, prairie dog sterilization, biological control, etc.).

In Alternative C, reintroduction of black-tailed prairie dogs could be considered after other resources have been evaluated for impacts. Reintroduction could be considered on vacant historic prairie dog colonies if the proposals are on large unfragmented blocks of public land (minimum of 10,000 or more acres of public land), adjoining landowners are cooperative, and relocations do not occur with one mile of private land so the growth of black-tailed prairie dog colonies would not impact other adjoining landowners. Other resources and uses would be considered prior to approval.

Effects to black-tailed prairie dog colonies from allowing oil and gas and renewable energy development would include direct and indirect habitat loss from roads, pipelines, power lines, well pad construction, and noise from the construction or production of the facility. Mortality of prairie dogs is expected from construction activities, installation of infrastructure that may increase predation on prairie dogs by providing raptor perches, and increased access for recreational shooting. All of these impacts would be expected to decrease the density and abundance of prairie dogs within a colony, and potentially cause abandonment or displacement of the colony. The impacts from development facilitating the spread of plague are unknown. Disturbances on the periphery of colonies from pipeline ROWs and corridors may increase the ability of prairie dogs to occupy habitat within the disturbed areas, and possibly expand or redistribute the colony into these areas. Actions from development would be expected to affect the majority of those species associated with prairie dogs, including those listed as BLM sensitive species (i.e., burrowing owls, ferruginous hawks) depending on those species' tolerance to disturbance.

Prohibiting surface-disturbing and disruptive activities or oil, gas and renewable energy development within 1/4 mile of burrowing owl nests which occur in most black-tailed prairie dog colonies would not be expected to have direct effects to prairie dog colonies. Some limited indirect effects may still occur to associated species from adjacent development, depending on those species' tolerance to disturbance. This alternative provides more protection for prairie dogs and other wildlife species associated with prairie dog colonies than Alternative A but less than Alternative C.

Swift Fox: The effects would be the same as described in Alternative A.

Raptors: Under Alternative C, an NSO lease stipulation would restrict surface-disturbing and disruptive activities within 1/2 mile of all raptor nesting sites and one mile for peregrine falcon nest sites which has been active within the last seven years. This would result in 4,095 acres of BLM-administered surface and 24,567 acres of subsurface habitat surrounding nests where long-term direct and indirect effects to reproductive success of the raptors would be minimized. This alternative would be more restrictive and benefit raptors more than the other alternatives.

Bats: The effects would be the same as described in Alternative B.

American Dipper: The effects would be the same as described in Alternative B.

Fish: The effects would be the same as described in Alternative B.

Aquatic and Fisheries Resources: The effects would be the same as described in Alternative B.

Visual Resources: Under Alternative C, VRM classes would include VRM Class I (0 acres), VRM Class II (11,590 acres), VRM Class III (181,025 acres) and VRM Class IV (80,815 acres). In this alternative, VRM classes are less restrictive as a

majority of the planning area is in VRM Class IV areas. In addition, VRM Class II acres are much lower. This alternative would provide limited protection to maintaining habitat integrity.

Fire Management and Ecology, and Forest and Woodland Products: Alternative C would provide for 350 forested acres to be mechanically treated for forest health. An additional 500 acres would be treated with prescribed burning. This is about three percent of the roughly 17,500 acres of forested/woodland habitat managed by the BLM in the planning area. Short-term direct impacts to wildlife from these treatments may be severe in treated areas. Long-term indirect effects to most special status species would be beneficial because of the decreased risk of large wildfire and an increase of early successional habitats favored by some species of special status species. Long-term indirect effects would be beneficial to most special status species as long as there is careful planning for burns in sagebrush habitats to avoid impacting the integrity of the complete sage habitats.

Although many of the short-term effects to special status species habitat and populations are mediated by reclamation, those reclaimed areas adjacent to or surrounding long-term habitat disturbance do not necessarily result in reclaimed wildlife habitat. Many species often avoid areas of long-term surface disturbance and disruption, resulting in long-term indirect effects.

Livestock Grazing and Vegetative Communities – Rangeland: Changes to rangeland vegetation would be similar across all alternatives. These changes are primarily derived from grazing on these habitats and current grazing management would be beneficial to wildlife by introducing large-scale diversity in grassland habitats. However, under Alternative C the minimum rest period from grazing following any major disturbance to vegetative communities is the same as Alternative B, which would benefit some special status species in the short term; long-term goals to promote diversity in grassland habitats would be increase with this management action as long as grazing within the disturbed areas does not impact soil resources and contribute to increased soil erosion.

Livestock grazing could be deferred up to one year before prescribed fire treatment and for a minimum of one growing season following treatment to promote vegetation recovery. Deferral or temporarily closure of livestock grazing for a minimum of one growing season for prescribed, wildfire or vegetative treatments can ensure a limited amount of vegetative response and establishment. To promote heterogeneity in grassland habitats, it may be beneficial to graze within one year of a burn to help maintain short grass habitats favored by a subset of prairie wildlife. Vegetative response after non-fire vegetative treatments, prescribed fires or wildfires would depend highly on fire intensity, moisture or precipitation, and overall site conditions, or until the burned or treated areas attain identified vegetative objectives. This would assure high quality habitat conditions exist and would provide adequate forage, nesting and thermal cover for numerous wildlife species including special status species.

Livestock grazing occurs throughout the planning area and has an effect on wildlife habitats including habitats for several special status species. Management of BLM-administered lands to meet Standards and Guidelines and changes to grazing seasons and livestock numbers if grazing was determined a causal factor for not meeting standards would minimize effects to wildlife habitats including special status species habitats. Change in numbers and monitoring of allotments not meeting Standards for Rangeland Health would reduce the potential effects from livestock grazing which include the following:

- competition for forage, water, and space;
- habitat alteration;
- competition for grass and forbs for big game;
- impacts to bighorn sheep from domestic sheep and goat grazing because of potential for disease transmission;
- degradations to stream banks from compression, sloughing, and removal of vegetation, resulting in erosion;
- changes in plant species composition from overuse;
- potential loss of shrubs in riparian areas, leading to a decrease in nesting habitat for riparian songbirds and bank stability;
- appropriate levels of grazing, stimulating growth of some plant species and increasing succulents;
- overgrazing which decreases range conditions;
- weed control to reduce weed spread and resultant impact to native plant communities;
- fences that create travel barriers, cause stress and energy loss, result in injury and death from entanglement, alter big game distribution, and create perches for predators;
- fences for control of livestock to reduce impacts on vegetation, streams, and thus wildlife; and

- water developments that expand the spatial and temporal range of where both big game and livestock can exist, creating more pressure on vegetation and competition with each other.

New water developments would allow increased use of an area by wildlife. New developments would provide previously unavailable watering sites for different wildlife species when livestock are not in the vicinity or conflicting with wildlife use of the area.

With regards to prescribed fire and wildfire, livestock grazing would lead to increased risk of invasion of nonnative species in the dry conifer and perennial grass types, and would increase tree density by limiting grass competition in the dry conifer type. Grazing also would reduce fine fuels which would affect the rate of spread and intensity of fire.

Recreation: Under Alternative C, two SRMAs would be designated (11,652 acres) and 262,680 acres would be designated as an ERMA. The ERMAs indicate less intensive management for recreation, as compared to SRMAs. This alternative would have an NSO lease stipulation for oil and gas activity, and renewable energy development and other ROWs would be excluded within one mile of SRMAs, which would provide the most protection to special status species habitat surrounding these areas. Additionally, non-commercial SRPs would be issued in the planning area; other SRPs would be issued if consistent with management goals and objectives. Under this alternative, snowmobile use would be restricted to designated roads and trails. These management restrictions would minimize impacts to wildlife by limiting increased human presence.

OHV Use and Travel Management Areas: OHV use is limited to existing roads and trails across the planning area (262,680 acres) except the Fort Meade ACEC (6,574 acres) which is limited to designated roads and trails. The impacts from OHV use on special status species are limited. Subsequent travel management planning will identify designated routes. This will be the same across all alternatives. Completing route-specific travel planning would minimize and mitigate effects to special status species and habitats with timing restrictions or other closures. Completing route-specific travel planning would minimize and mitigate effects to wildlife (including special status species) and habitats with timing restrictions or other closures.

Lands and Realty

Rights-of-Way, Leases and Permits: Under Alternative C, all fiber optic telephone, power and other lines would be buried. This would minimize or eliminate the collision potential for avian species and create raptor perches that adversely affect small game and non-game species. Alternative C would designate Greater Sage-Grouse PPAs (96,379 acres of BLM-administered surface) as an exclusion area for renewable energy and other ROW authorizations. This would provide the greatest protection to sage-grouse species, as well as protect critical habitat for sagebrush obligate and grassland species by eliminating habitat fragmentation at the landscape scale and minimizing surface-disturbing and disruptive activities. Impacts from the construction of ROWs within other important wildlife habitat would include short-term disruption and displacement of individuals and direct mortality to less mobile species. Long-term adverse impacts would include habitat loss and fragmentation.

Withdrawals: Under Alternative C, the Fort Meade ACEC (6,574 acres) and Fossil Cycad ACEC (320 acres) would continue to be withdrawn from mineral entry except for oil and gas which would be closed to mineral entry in the ACEC. Within Bear Butte State Park, 410 acres would be recommended for withdrawal from mineral entry. These management actions would protect wildlife habitat, eliminate surface disturbance from activities related to mineral extraction, and minimize habitat fragmentation from related facilities. The withdrawal of locatable minerals in Greater Sage-Grouse PPAs would have limited benefit as most areas with potential have already been claimed and would not be affected by a mineral withdrawal. In the rest of the planning area, there would be no restrictions to surface disturbance except Guidelines, BMPs and standard restrictions and mitigation practices that are implemented at the project level. Potential impacts from loss of habitat and displacement due to disturbance activities could occur.

Land Tenure: Impacts from land tenure adjustment would be the same as identified under Alternative B. The effects of land tenure on wildlife would be beneficial through the consolidation and acquisition of lands that contain special status species habitat by enhancing connectivity as well as providing management restrictions to protect important wildlife habitats when in federal ownership.

Minerals

In Greater Sage-Grouse PPAs, oil and gas and non-energy leasable minerals would be closed to leasing, locatable minerals would be withdrawn, salable minerals would be closed, and coal would be unsuitable.

Fluid Minerals: Impacts from energy and mineral activities could include disturbance to special status species during construction and operation. Adverse impacts include surface disturbance and disruption, and increase in human presence, habitat loss and fragmentation, direct mortality of individuals, and an increase in noise.

Alternative C would provide the greatest number of stipulations, compared to other alternatives, to minimize disturbance impacts from oil and gas activities at local scales through stipulations that limit timing or distance from key wildlife resource values. These protections would benefit special status species and other wildlife species located in these areas by minimizing surface-disturbing activities and associated avoidance.

Under Alternative C, approximately 100,160 surface and 309,576 subsurface acres would be closed to oil and gas leasing to protect a variety of resource values, such as Greater Sage-Grouse PPAs, special status species, and other wildlife. This closure would result in a higher degree of protection for sage-grouse compared to Alternatives A, B and D. An additional 43,897 surface acres and 355,396 subsurface acres would be available for leasing subject to an NSO lease stipulation for such areas as sage-grouse leks in the GHA, raptor nest sites, floodplains, and other resource concerns (see Chapter 2, Summary of Restrictions Table 2-1). These restrictions would benefit special status species and other wildlife species and their associated habitat located in these areas by minimizing surface-disturbing and disruptive activities and associated avoidance. Approximately 45,836 acres of BLM-administered surface and 244,689 subsurface acres would be available for leasing with TL stipulations such as sage-grouse, sharp-tailed grouse, and greater prairie-chicken nesting habitat and winter range. These restrictions would minimize short-term direct disturbances and adverse impacts to special status species during critical time periods from initial development, but would not provide protection during the short- and long-term operation and maintenance periods. Approximately 1,535 BLM-administered surface acres and 1,535 subsurface acres would also be available with CSU restrictions. These restrictions would avoid or minimize habitat loss and disturbances. Also, approximately 52,146 BLM-administered surface and 451,382 subsurface acres would be managed as open to leasing and subject to standard lease terms. Wildlife species could be adversely impacted by surface-disturbing activities. Impacts under these management activities would include short-term displacement of individuals, disturbance from human presence and equipment use, and habitat loss.

The number of new oil and gas wells on BLM-administered land and federal mineral estate anticipated under Alternative C is 43 wells. Most of these wells would be located within the high (20 wells) and moderate (11 wells) development potential areas based on the reasonably foreseeable development scenario. The new development in high potential oil and gas areas would push the threshold of 1.04 mean well density for some special status species such as sage-grouse. Most of this disturbance and disruption would occur in grassland/sagebrush/shrubland habitats.

The responses of wildlife to facilities and activities associated with oil and gas activities are complex but well documented (FSEIS 2008). Potential effects include fragmentation of habitat and noise and movement disturbance due to the exploration, construction, and operation of facilities and roads related to the timing and nature of the disturbance, severity of the winter, species and habitat type present, physiological status of the animal, hunting pressure, and other disturbance factors. One of the greatest effects to wildlife and wildlife habitats includes the indirect effect of habitat fragmentation and avoidance by wildlife (Hebblewhite 2008).

Although stipulations may mitigate impacts at local levels, impacts to wildlife often happen at much larger scales. Large-scale impacts to wildlife and wildlife habitats are best described by the density of impacts on the landscape. Impacts to wildlife and wildlife habitat from the development of roads would occur from oil and gas development. Impacts to populations are often not immediate and may be manifested in population level responses a number of years after the initial disturbance

The scale of development, location and implementation measures all influence the severity of impacts to wildlife habitat and species, including special status species. The application of CSU and timing stipulations and lease terms would provide some protection and minimize some of the effects to special status species and associated habitats. The mineral closure in all alternatives for the Fort Meade ACEC would mitigate mineral exploration and development effects to wildlife habitats because no development actions resultant from mineral exploration and development would occur.

Although some of the short-term effects to special status species habitat are mediated by reclamation, those reclaimed areas adjacent to, or surrounding long-term habitat disturbance do not necessarily result in reclaimed wildlife habitat. Many species often avoid areas of long-term surface disturbance and disruption, resulting in long-term indirect effects. The avoidance or lower probability of use of habitats near surface-disturbing and disruptive activities creates indirect habitat losses. Loss of habitat, whether direct or indirect, can reduce populations via reduced survival, reduced reproduction, or emigration. Individuals pushed from habitats near disturbances will increase densities on remaining habitats, exposing populations to greater density-dependent effects (Sawyer, et al. 2005).

Effects from geophysical exploration include wildlife displacement, nest abandonment or direct nest loss and overall habitat fragmentation to numerous wildlife species, including special status species such as ground nesting birds that are protected by the Migratory Bird Treaty Act. The scale of development, location and implementation measures all influence the severity of impacts to wildlife habitat and species, including special status species. Application of a CSU, timing stipulations, and lease terms would provide some protection and mitigate a portion of the effects addressed above. Prohibiting geophysical exploration and an NSO lease stipulation would mitigate most effects because no action would occur unless a waiver, exception, or modification is granted.

There are few areas where incremental development would be avoided and special status species habitat would remain at risk as the percentage of lands affected by development continue to increase throughout the life of the plan.

Solid Minerals and Mineral Materials: Effects to wildlife habitats, including habitats for special status species, from locatable mineral actions such as bentonite mining and potential uranium development include loss and fragmentation of habitat (direct and indirect effects), as well as disturbances from noise and movement from the exploration, construction, and operation of facilities and roads. Alternative C would withdraw locatable minerals in Greater Sage-Grouse PPAs. The only locatable mineral that is currently being developed in sagebrush areas is bentonite (Map 2-8). The withdrawal of locatable minerals in Greater Sage-Grouse PPAs would not result in a substantial reduction of activity associated with mineral development as the majority of moderate to high potential bentonite mineral is already claimed and any withdrawal would not include valid existing rights (existing claims).

The closure of other leasable minerals (non-energy leasable minerals) and designation of coal as unsuitable in Greater Sage-Grouse PPAs would result in little change as there is little interest or development potential for these minerals in Greater Sage-Grouse PPAs.

The closure of salable minerals in Greater Sage-Grouse PPAs would result in negligible impacts as there is little interest or potential in sand, gravel or other salable minerals in Greater Sage-Grouse PPAs. Refer to the reasonably foreseeable development section at the beginning of this chapter for additional details about mineral development potential.

Mineral material sales actions would affect wildlife habitats, including habitats for special status species, directly from habitat loss and indirectly from habitat fragmentation and avoidance. Implementation plans would be required which would ensure effects to wildlife habitats and species would be mitigated.

Renewable Energy: Alternative C would result in the most protection to special status species and their habits from renewable energy development.

Under Alternative C, a total of 199,420 BLM-administered surface acres would be excluded from commercial renewable energy development. These areas include: Greater Sage-Grouse PPAs (96,379 acres of BLM-administered surface), sage-grouse brood rearing/nesting habitat in GHAs (20,929 acres), and BLM-administered lands within SRMAs (11,652 acres), including a one mile buffer around the SRMAs. Additional exclusion restrictions include big game and sage-grouse winter range (121,406 acres of BLM-administered surface). Alternative C would provide more acres protected in PPAs (96,379 acres) versus 84,384 acres protected in PPAs in Alternative B.

Wind energy development affects various bird and bat species in several ways including collisions with rotors, towers and power lines, electrocutions, avoidance of turbines and habitat in the project area, and indirect habitat loss from turbines, roads, power lines, and associated buildings. For example, prairie grouse species are affected by habitat fragmentation and have been observed avoiding leks near wind projects (Proceedings of the Wind energy and Birds/Bats, Resolve Inc., Washington D.C., S. Schwartz, Sept. 2004). The bat and windmill issue has also become increasingly public. For instance, a recent court ruling in West Virginia stopped the construction of numerous wind turbines because of the conclusion that the

project would have wounded, harmed, or killed the Indiana bat. Limited information exists on solar and wind energy project effects to wildlife habitats and species including sage-grouse.

To minimize the impacts to special status species from wind towers and associated structures that would affect the habitat and viewsheds, no commercial wind energy development would be allowed within the Fort Meade and Fossil Cycad ACECs, within one mile of SRMAs, or within VRM Classes I and II. This would result in an additional 11,652 acres of BLM-administered surface habitat within these areas being closed to wind energy development. Acres listed above include only surface acres and are not additive as some restricted acres overlap.

In addition, no development would be allowed in areas where studies confirm wintering areas, migration or connectivity routes, or breeding concentrations of raptors or other wildlife. Adverse impacts to wildlife would be eliminated or minimized by excluding these areas, which would reduce loss of habitat, individual mortality, noise, and disturbance from increased human presence and activity. These restrictions would prevent impacts to special status species such as bat and avian species by minimizing collision potential and not interrupting behaviors such as foraging and migration.

Limited baseline data is available on special status species and other wildlife use in the planning area, so multi-year preconstruction wildlife studies will be required to confirm what wildlife activities are occurring on the proposed development sites. No development would be allowed within the proposed site unless the impacts to wildlife present can be mitigated. There could be an opportunity for off-site mitigation. To minimize renewable energy impacts to special status species and other wildlife on the development sites, the potential developer would have to develop a plan with specific designs to mitigate impacts before permitting can be completed.

To analyze the effects of reasonably foreseeable wind energy development, the BLM analyzed the effects of a wind energy proposal for 256 megawatts. This proposal would involve the construction of 73 wind turbines that would leave a footprint on approximately 3,181 acres. Short-term disturbance for this project is projected to be 588 acres and long-term disturbance would be 78 acres. Surface-disturbing actions associated with the construction of this wind energy proposal would include the creation of new roads, increased soil erosion, and vegetation loss from the construction of wind turbines and power lines.

The development of wind energy projects within high value habitats for grassland birds would result in short-term and long-term population declines of the species through direct mortality from wind farm operations as well as indirect impacts through avoidance of the towers and other infrastructure, power lines, roads, buildings, and operation activities (vehicle traffic, human presence, and disturbance). Development within high value sage-grouse habitat would also result in short-term and long-term population declines of the species through direct mortality from wind farm operations as well as indirect impacts through avoidance of the towers and other infrastructure and power lines, roads, buildings, and operation activities (vehicle traffic, human presence, and disturbance). Impacts could be particularly high for a sage-grouse population that spends 64 percent of the year within two miles of leks.

The impacts of this wind energy proposal would mainly depend on the type of special status species habitat it is located within. The proposal would likely be located within grassland or shrub steppe habitats. In general, impacts to special status species habitat and populations would be greatest and result in impacts to habitat and populations when the project is located in areas with high value to wildlife, such as wintering areas, nesting areas, grouse leks, staging areas, and migration stopovers or corridors. Project impacts would be greatest in areas of intact habitat in the planning area where development would result in habitat degradation, loss or fragmentation. This would particularly impact areas with special status species that are sensitive to habitat fragmentation, areas identified as critical for the recovery of a listed species, an expansion area of a recovering species, or core population areas. Impacts to special status species from wind energy development located away from areas of high values for special status species would minimize impacts to priority wildlife species in the planning area.

There is less potential for development in Alternative C than Alternative B.

Special Designations: Compared to Alternatives B and D, an ACEC designation of PPAs within Alternative C would not result in any noticeable or measurable benefits to wildlife and special status species as numerous protective measures are already provided through other actions for the Greater Sage-Grouse PPAs or for wildlife and special status species.

Impacts under Alternative D (Preferred Alternative)

Water Resources: Alternative D would protect surface water from impacts associated with soil erosion and runoff from disturbed areas and from other actions the same as described under Alternative B.

Soil Resources: The impacts from ROW restrictions on sensitive soils and slopes would be the same as Alternative B, with sensitive soils being treated as avoidance areas for renewable energy development and ROWs. This would only minimize the impacts to wildlife but would not provide the same level of protection as an exclusion area because an avoidance area may allow some activities to occur provided there is no other practical means to avoid sensitive soils and the impacts to sensitive soils can be minimized. Sensitive soils are present on approximately 57,971 acres (21 percent) of BLM-administered public lands. Oil and gas activity on sensitive soils would have the same impacts as Alternative B. Under Alternative D, impacts to soils from surface occupancy and use would prohibit oil and gas activity on slopes 50 percent or greater, while restricting this activity with an NSO stipulation on slopes between 25-50 percent (see Table 4-26). These restrictions would maintain or improve wildlife habitat by reducing surface disturbance and protecting the integrity of habitats.

Vegetative Communities: Impacts would be the same as Alternative B.

Noxious Weeds and Other Non-Native Invasive Species: The effects would be the same as in Alternative B.

Wildlife

Special Status Species: Alternative B would provide a number of stipulations to minimize disturbance impacts from oil and gas activities at local scales through stipulations limiting timing or distance from key special status species resource values. Restricted lands within the planning area for renewable energy and ROWs will be either avoidance areas, exclusion areas or in some cases a combination of avoidance and exclusion areas. These are addressed below under each special status species category. The acreage figures are not additive as some resource values overlap.

In addition to the actions noted above, specific management actions and impacts for special status species categories are described below:

Threatened and Endangered Species

Whooping Crane:* Alternative D does not provide specific guidance or management actions for whooping cranes.

Piping Plover: The effects would be the same as described in Alternative A except that these areas would be avoidance areas for renewable energy development and other ROWs.

Least Tern: The effects would be the same as described in Alternative A except that these areas would be avoidance areas for renewable energy and other ROWs.

Black-footed Ferret: The effects would be the same as described in Alternative C.

Gray Wolf:* Alternative D does not provide specific guidance or management actions for gray wolves.

Pallid Sturgeon:* Alternative D does not provide specific guidance or management actions for pallid sturgeon. Management actions that improved habitat and water quality should have a beneficial impact on this species.

Topeka Shiner:* Alternative D does not provide specific guidance or management actions for Topeka shiner. Management actions that improved habitat and water quality would have a beneficial impact on this species.

Poweshiek skipperling:* Alternative D does not provide specific guidance or management actions for Poweshiek skipperling. Management decisions that improve habitat and water quality would have a beneficial impact on this species.

American Burying Beetle:* Alternative D does not provide specific guidance or management actions for American burying beetle.

*Scaleshell mussel**: Alternative D does not provide specific guidance or management actions for scaleshell mussel. Management actions that improve habitat and water quality would have a beneficial impact on this species.

Higgins eye (pearlymussel):* Alternative D does not provide specific guidance or management actions for Higgins eye. Management actions that improve habitat and water quality would have a beneficial impact on this species.

American Burying Beetle:* Alternative D does not provide specific guidance or management actions for American burying beetle.

Candidate Species

Sprague's Pipit: The effects would be the same as described in Alternative B; this will be addressed at the project level.

Greater Sage-Grouse: Alternative D would require the BLM to use the national sage-grouse conservation strategies as standards in the planning area except for habitat standards which would be derived from regional standards. Regional standards for sage-grouse habitat would be cooperatively developed from recent habitat inventories and population parameters in the planning area along with relevant range-wide research findings. Management under Alternative D would also emphasize restoration and rehabilitation of sagebrush to contribute to the distribution and connectivity of habitat patches in areas capable of, but no longer supporting sagebrush.

Under Alternative D, 83,744 acres of BLM-administered surface and 253,357 acres of subsurface within Greater Sage-Grouse PPAs would be managed to maintain sage-grouse habitat and populations by limiting habitat loss and fragmentation. The restrictions would limit surface-disturbing and disruptive activities by NSO and timing stipulations for oil and gas activities; the area would be an exclusion area for wind energy development, and an avoidance area for other ROWs. These restrictions would limit the short-term and long-term impacts of sage-grouse disturbance associated with oil and gas and other surface-disturbing and disruptive activities in Greater Sage-Grouse PPAs as discussed in Alternative C.

Outside the PPAs, Alternative D would restrict activities with an NSO around the lek site and timing restrictions for nesting areas and winter range. The NSO within one mile of occupied leks would minimize impacts to breeding sage-grouse. The distance associated with this NSO lease stipulation would limit disturbances and disruptions in 2,407 acres of BLM-administered surface and 6,243 acres of subsurface around sage-grouse leks. The nesting, brood rearing, and winter range TL would provide protection to limit changes to sage-grouse populations from disturbances and disruptions near the lek site as discussed in Alternative C. These stipulations would help mitigate short-term impacts to sage-grouse on winter ranges and nesting and brood-rearing areas, but would not address long-term indirect impacts to sage-grouse from activities that would occur outside the timing restriction since local studies showed 62 percent of the time they were within 1.98 miles of lek sites (Kaczor 2008).

Greater Sage-Grouse BLM Photo

Alternative D includes restrictions for the development of wind energy within sage-grouse habitat. It is specifically excluded in sage-grouse lek areas, wintering areas and PPAs (84,384 acres), ACECs (6,894 acres), and SRMAs (11,652 acres). Impacts to sage-grouse from wind energy development are similar in Alternatives B and C. These restrictions would limit the disturbance and disruption associated with wind power generation in sage-grouse priority areas and where other resources conflict with wind energy development and long-term and short-term impacts.

Developing bentonite minerals and wind-energy facilities on BLM land under Alternative D could result in long-term adverse impacts to sage-grouse by destroying and fragmenting sagebrush habitats, but the impacts would be mitigated by the establishment of sage-grouse priority areas and stipulations for surface-disturbing and disruptive activities.

As noted in Alternative B, the relative risk of noxious weed infestation between alternatives can be measured by the amount of roads expected under each alternative. Alternative D has the same risks of noxious weed infestation as Alternative B, resulting in higher risks to sage-grouse habitats than Alternative C.

Changes to vegetation structure and composition from fire and grazing are the same as described in Alternative B.

Utility and power lines (overhead lines) that can be safely buried within two miles of sage-grouse leks would be buried. If overhead lines cannot be buried, they would be designed to minimize impacts of predation, collision and other associated stressors. This action would result in more protection from predation and collision for sage-grouse populations because there would be fewer miles of power lines or the power lines would be designed to lower stressors associated with power lines in sage-grouse habitat.

Management under Alternative D would also emphasize restoration and rehabilitation of sagebrush to contribute to the distribution and connectivity of habitat patches in areas capable of, but no longer supporting sagebrush.

Lands within one mile of sage-grouse leks would have an NSO lease stipulation under Alternative D. The NSO lease stipulation around leks would minimize disturbances to breeding activities and avoid impacts to those birds nesting within one mile of a lek on 2,407 acres of BLM-administered surface and 9,357 acres of subsurface lands. A timing restriction on oil and gas activities would also be applied to sage-grouse winter range from December 1 to March 31, however some activity would be allowed provided a plan is provided that demonstrates impacts would be addressed. This action would protect 50,791 acres of BLM surface estate and 103,553 acres of mineral estate (same acres as Alternatives B and C).

Under Alternative D, surface-disturbing and disruptive activities in sage-grouse nesting and brood rearing would not be allowed from March 1 to July 15 within four miles of a sage-grouse lek. In this respect, Alternative D would provide the same level of protection as Alternative C as both address the same time frame and protective buffer. This would provide better protection than Alternatives A and B which provide two and three miles buffers respectively.

The stipulations would mitigate short-term impacts to sage-grouse on winter ranges and nesting and brood-rearing areas, but would not address long-term indirect impacts to sage-grouse from activities that would occur outside the timeframes provided above.

Impacts to leks located in the high and moderate oil and gas development potential areas would be similar to those described in Alternative B.

Alternative D also provides specific guidance or management actions for the protection of priority habitat areas listed above from habitat loss and fragmentation. Approximately 83,744 acres of BLM-administered surface and 253,357 acres of subsurface have an NSO lease stipulation for oil and gas leasing and a 84,384 acres exclusion area for renewable energy development to maintain sage-grouse habitat by limiting surface-disturbing and disruptive activities, thereby reducing the impacts from habitat loss and fragmentation. At the APD stage conditions of approval would be added such as limiting noise and the use or number of vehicles, and remote monitoring.

Dakota Skipper:* Alternative D does not provide specific guidance or management actions for Dakota skipper.

****The whooping crane, gray wolf, pallid sturgeon, Topeka Shiner, Poweshiek skipperling, American burying beetle, Dakota skipper, scaleshell mussel, and Higgins eye mussel** have a low probability of occurring on BLM-administered surface and/or minerals. Management actions in this RMP would have minimal effect on these species as those actions described would occur on an extremely limited amount of habitat associated with these species. Throughout the life of the RMP, additional information would be considered as it becomes available and impacts to these species would be assessed at the project level.*

Sensitive Species

Black-tailed Prairie Dog: The effects would be the same as described in Alternative B with the consideration for reintroduction of black-tailed prairie dogs after other resources have been evaluated for impacts. Reintroduction could be considered on vacant historic prairie dog colonies if the proposals are on large unfragmented blocks of public land (minimum of 10,000 or more acres of public land), adjoining landowners are cooperative, and relocations do not occur with one mile of private land so the growth of black-tailed prairie dog colonies would limit impacts to other adjoining landowners.

Swift Fox: The effects would be the same as described in Alternative B.

Raptors: The effects would be the same as described in Alternative B except that these areas would be exclusion areas for renewable energy development and avoidance areas for other ROWs.

Bats: The effects would be the same as described in Alternative B.

American Dipper: The effects would be the same as described in Alternative B.

Fish: The effects would be the same as described in Alternative C.

Aquatic and Fisheries Resources: Impacts would be the same as Alternative B except that these areas would be avoidance areas for renewable energy development and other ROWs.

Visual Resources: Impacts would be the same as Alternative B except VRM Class II would be an exclusion area.

Fire Management and Ecology: The effects would be the same as in Alternative B.

Forest and Woodland Products: The impacts would be the same as in Alternative B.

Livestock Grazing and Vegetative Communities – Rangeland: The effects would be the same as described in Alternative B.

Recreation: Impacts would be the same as Alternative B except both the Fort Meade and Fossil Cycad ACECs would be exclusion areas for renewable energy development and other ROWs. Also, the SRMAs would be exclusion areas for renewable energy development and avoidance areas for other ROWs.

OHV Use and Travel Management Areas: The effects would be the same as in Alternative B.

Lands and Realty

Rights-of-Way, Leases and Permits: Impacts would be the same as Alternative B.

Withdrawals: Impacts would be the same as Alternative C.

Land Tenure: Impacts from land tenure adjustment would be the same as identified under Alternative B.

Minerals

Fluid Minerals: Approximately 6,894 acres of BLM-administered surface and subsurface lands would be closed to oil and gas leasing under Alternative D to protect a variety of resource values, not just special status species. An additional 183,877 BLM-administered surface acres and 893,527 subsurface acres would be available for leasing with NSO, CSU and TL stipulations, of which 98 percent are located in the very low oil and gas development potential area. Also, 52,803 BLM-administered surface acres and 461,747 subsurface acres would be available for leasing with standard stipulations. These protections would benefit all wildlife species located in these areas by minimizing surface-disturbing and disruptive activities and associated avoidance.

Although these stipulations may mitigate impacts at local scales, impacts to wildlife often happen at much larger scales. Large-scale impacts to wildlife and wildlife habitats are best described by the density of impacts on the landscape. Impacts to populations are often not immediate and may be manifest in population level responses a number of years after the initial disturbance.

Alternative D would provide a number of stipulations to protect from and minimize disturbance impacts from oil and gas activities at local scales through stipulations limiting timing or distance from key wildlife resource values. These are addressed in each wildlife category. The acreage figures are not additive as some resource values overlap.

The number of new wells on BLM-managed lands (mineral estate) anticipated under Alternative D is 75 wells. Most of these wells would be located in the high (35.5 wells) and moderate (19.25 wells) development potential areas.

Although many of the short-term effects to wildlife habitat and populations are mediated by reclamation, those reclaimed areas adjacent to or surrounding long-term habitat disturbance do not necessarily result in reclaimed wildlife habitat. Many species often avoid areas of long-term surface disturbance and disruption resulting in long-term indirect effects.

Renewable Energy: Impacts would be less than under Alternative B as more acres (118,904) would be excluded, and fewer acres(78,636) would be in avoidance areas.

Special Designations: The effects would be the same as under Alternative B except both the Fort Meade and Fossil Cycad ACECs would be exclusion areas for renewable energy development and other ROWs. In addition, Fossil Cycad ACEC would be closed to oil and gas development.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Impacts from BLM actions under all alternatives are additive to impacts occurring on non-BLM lands throughout the planning area. Non-BLM impacts generally will not vary by alternative and are discussed here as the baseline to which impacts described for BLM actions under each alternative will be added.

The primary direct impact to special status species and their habitats in the planning area is the direct loss of native habitats from conversion to small grain production. Much of this conversion occurred in the past resulting in agricultural lands, primarily in the eastern portion. However, continued conversion is expected on private lands in the planning area based on current trends in the Northern Great Plains (Fargione, et al. 2009). In addition, contracts on private lands currently enrolled in the Conservation Reserve Program in South Dakota and not currently cropped may not be renewed, resulting in additional losses of wildlife habitat (Fargione, et al. 2009). The percent of non-federal surface ownership converted to cropland will incrementally continue to increase through the life of the plan. Oil and gas activities on non-BLM lands in the planning are projected to vary by RMP alternative.

Renewable energy projects could also impact important special status species and their habitat in the planning area. No wind farms are currently in production or are definitely planned in the region. Wind farms placed in special status species habitat could result in significant long-term direct and indirect impacts to many special status species through direct mortality (particularly birds and bats) to avoidance, displacement, and habitat fragmentation resulting in population level impacts.

Cumulative impacts to special status species and their habitats are expected to be most prevalent where BLM lands are mixed with non-federal lands and synergistic effects of direct habitat loss through conversion to cropland and indirect disturbances, primarily from oil and gas activities, are expected to occur. Alternately, large blocks of BLM land or blocks where BLM land is interspersed with private rangeland without high densities of surface-disturbing activities are expected to continue to provide important special status species habitat.

The greatest impact would occur where important wildlife habitats overlap with high oil and gas and renewable energy development potential (see Table 4-38) and in those areas experiencing conversion of private land rangelands to cropland.

Based on information in the 2011 USDA report and a review of Natural Agriculture Statistics data, Resources Inventory on planted acres, BLM estimates that a maximum of 66,000 acres of rangeland on non-federal lands are likely to be converted to cropland in the nine counties with substantial amounts of surface estate (Harding, Butte, Lawrence, Pennington, Custer, Fall River, Perkins, Meade and Stanley counties) over the next ten years. If trends continue in this manner, a maximum of 132,000 acres of these lands may be converted to cropland over the next 20 years. The majority of this conversion would result in surface disturbance, although certain farm practices such as no-till farming and other conservation practices would reduce the degree of disturbance. The acres provided are the maximum number of acres that are expected to be converted from grassland to cropland; actual acres may be lower in certain counties such as western Butte County where soils have lower potential for farming. This will vary slightly by alternative.

Oil and gas development could result in conversion of a maximum of 392 acres of short-term disturbance on other lands in the nine-county area. Oil and gas development on private surface and split estate minerals is expected to result in a maximum of 237 acres of long-term surface disturbance. Development of other BLM-administered minerals is expected to result in a maximum of 400 acres of short-term disturbance and 100 acres of long-term disturbance in the nine-county area. Bentonite and gravel mining would account for most of the acres disturbed. This will vary slightly by alternative.

The BLM estimates that wind energy development would result in up to 3,500 acres of short-term disturbance and 900 acres of long-term disturbance on lands that are not administered by the BLM (other federal lands, private, state, tribal lands, etc.). The maximum levels of wind energy development on BLM-administered surface estate are expected to result in 924 acres of short-term disturbance and 231 acres of long-term disturbance. This will vary slightly from by alternative.

Cumulative Impacts under Alternative A (Current Management)

The lack of management actions for Alternative A would slowly degrade existing conditions for special status species in portions of the planning area through incremental development of surface-disturbing and disruptive actions, regardless of land ownership and the limited beneficial impacts of the current BLM stipulations to mitigate impacts to wildlife at regional scales. This would result in long-term declines in a number of some special status species populations in portions of the planning area, particularly the high and moderate oil and gas development potential areas, through direct impacts (increased mortality of individuals) and indirect effects (increased fragmentation and avoidance of impacted areas) as measured by surface-disturbing activity densities. Mean well densities would also exceed thresholds for impacts to sage-grouse in the high intensity drilling areas of the high and moderate oil and gas development potential areas.

There are few areas in the planning area where incremental development would be avoided. Wildlife habitat in the low and very low development potential areas would continue to remain at risk as the percentage of lands affected by development increases throughout the life of the plan.

Wind energy development is open on all BLM surface ownership anywhere in the planning area except the Fort Meade ACEC which is excluded from development in Alternative A. This alternative would not limit the cumulative impact from wind development. However, Alternative A has no specific management actions noted that would limit fragmentation of important habitat areas and wind and solar developments would have short-term and long-term direct and indirect impacts on high value wildlife habitats and wildlife populations associated with those habitats. These impacts would be additive with increased renewable energy development on private lands. Alternative A allows greater renewable energy development than Alternatives B and C.

The impacts noted above would be additive to current and continued loss of habitat through conversion to cropland, particularly in those areas where land ownership is fragmented and crop production is adjacent to or nearby BLM lands.

Cumulative Impacts under Alternative B

Management actions proposed under Alternative B would close 6,574 acres of BLM-managed surface and 6,574 subsurface lands to oil and gas leasing, and 105,837 acres of surface and 404,306 acres of subsurface would have an NSO lease stipulation. PPAs with large blocks of relatively intact habitat would be NSO for oil and gas development and managed to maintain habitat integrity for sage-grouse (83,744 BLM-administered surface acres and 253,357 subsurface acres). About half of all lands in PPAs would receive adequate protection for sage-grouse, the other portions in the high to moderate oil and gas development area (private land in the northern portion of PPAs) may receive a level of development on private

lands that is detrimental for sage-grouse regardless of BLM actions (refer to Map 2-4 for Greater Sage-Grouse PPAs and Figure 4-1 for a display of the oil and gas development potential).

Management of these areas would strive to maintain or improve current habitat conditions and would greatly enhance habitat integrity and connectivity providing long-term benefits to other wildlife species in those areas. These actions would help ensure viable populations at a regional scale and provide connectivity to allow for potential range shifts if habitat conditions change.

Despite NSO closure of significant portions of BLM-managed surface and subsurface lands, special status species habitat conditions would slowly degrade on private lands within the high and moderate oil and gas development potential areas through incremental development of surface-disturbing and disruptive actions combined with the current level of disturbance. Under Alternative B, mean well densities in high and moderate development potential areas would exceed 1.04 wells per mi^2 (see Table 4-39), especially in high intensity drilling areas, except the low and very low development potential areas.

A decline in populations of sage-grouse would be expected within the high and moderate development potential areas under Alternative B because of direct impacts (increased mortality of individuals) and indirect effects (increased fragmentation and avoidance of impacted areas) as measured by the density of surface-disturbing and disruptive activity.

Mean well densities would exceed thresholds for sage-grouse in the high and moderate development potential areas. This would result in declines in sage-grouse populations as measured by the number of males at leks and loss of most large (>25 males) leks. The planning area had only two sage-grouse leks with more than 20 males in attendance in 2011.

Wind energy development would be avoided on 189,153 acres of BLM surface ownership (primarily sage-grouse priority areas and ACECs) which would limit the impacts from wind development in those areas. Alternative B would provide management actions that would help avoid fragmentation of important habitat areas and short-term and long-term direct and indirect impacts from wind energy developments would be limited.

While some loss of habitat for sensitive status species would continue on other lands, loss of habitat on BLM-administered lands would be lower than under current management. Actions provided in Alternative B would have beneficial impacts on sensitive species by providing a basic level of protective measures in and around important habitat and limiting disruptive activities during critical periods.

Cumulative Impacts under Alternative C

Management actions proposed under Alternative C would close 100,160 BLM-managed surface and 309,576 subsurface acres to oil and gas leasing. An additional 43,897 surface and 355,396 subsurface acres would have an NSO lease stipulation. PPAs with large blocks of relatively intact habitat would be closed for oil and gas development and managed to maintain habitat integrity for sage-grouse (93,266 BLM-administered surface acres and 289,563 subsurface acres). About half of all lands in PPAs would receive adequate protection for sage-grouse, the other portions in the high to moderate oil and gas development area (private land in the northern portion of PPAs) may receive a level of development on private lands that is detrimental for sage-grouse regardless of BLM actions (refer to Map 2-5 for Greater Sage-Grouse PPAs and Figure 4-1 for a display of the oil and gas development potential).

Management of these areas would strive to maintain or improve current habitat conditions and would greatly enhance habitat integrity and connectivity, providing long-term benefits to wildlife species in those areas. These actions would help ensure viable populations at a regional scale and provide connectivity to allow for potential range shifts if habitat conditions change.

Wildlife habitat and special status species conditions would slowly degrade in the high and moderate oil and gas development potential areas through incremental development of surface-disturbing and disruptive actions combined with the current level of disturbance on private lands. Under Alternative C, mean well densities on BLM land in high and moderate development potential areas would exceed 1.04 wells/mi^2 (see Table 4-39), especially in high intensity drilling areas. A decline in populations of sage-grouse would be expected within the high and moderate development potential areas under Alternative C because of direct impacts (increased mortality of individuals) and indirect effects (increased fragmentation and avoidance of impacted areas) as measured by surface-disturbing activity densities. Incremental

development would continue outside areas where development is precluded or densities are controlled. Wildlife habitat in these areas would remain at risk as the percentage of lands affected by development continues to increase throughout the life of the plan.

A closure/withdrawal of minerals, ACEC designation and ROW exclusion developed for Alternative C would benefit wildlife and special status species on BLM-administered lands within the PPA through decreased levels of commercial use and less disruptive activities and infrastructure; however, these actions would, in some cases, force and concentrate this use and infrastructure onto private and non-federal lands within the PPA and onto private and non-federal lands adjacent to the PPA. When this occurs, the BLM would lose control over project design features and mitigation of site-specific impacts, and the BLM would not be able to require disturbed areas to be reclaimed.

While the NSO stipulation provided in Alternatives B and D would also tend to shift some future oil and gas activities and infrastructure onto private or non-federal lands adjacent to the PPAs or to private or non-federal lands within the PPAs, the impact would be less than Alternative C as the NSO would not be combined with an ACEC designation and an exclusion of non-renewable energy ROWs.

The greatest cumulative impact in the life of the plan would occur in areas where rangeland is converted to cropland and in the high development potential areas where mean well densities would rise and road densities would increase, resulting in loss of most current special status species habitat in that area, especially on private lands.

Wind energy development would be excluded from 199,420 BLM-administered surface acres which would limit the cumulative impacts of wind development in those areas. Alternative C would provide management actions that would limit fragmentation of important habitat areas such as sagebrush. Short-term and long-term direct and indirect impacts from wind developments would be minimized.

While some loss of habitat for sensitive status species would continue on other lands, loss of habitat on BLM-administered lands would be minimal under Alternative C. Actions provided in Alternative C would have beneficial impacts on sensitive species by providing the highest degree of protective measures in and around important habitat and limiting disruptive activities the most during critical periods. Although in some cases, the level of restriction or the amount of BLM-administered lands that are closed or withdrawn may result in activity proposed on BLM-administered lands being moved to adjacent private lands where limited restrictions and no reclamation requirements exist.

Cumulative Impacts under Alternative D (Preferred Alternative)

The management actions for Alternative D would provide the greatest level of protection on BLM-administered lands. Management actions proposed under Alternative D would close 6,894 BLM-managed surface and 7,304 subsurface acres to oil and gas leasing. An additional 107,025 surface and 406,005 subsurface acres would have an NSO lease stipulation. PPAs with large blocks of relatively intact habitat would have an NSO stipulation for oil and gas development and would be managed to maintain habitat integrity for sage-grouse (83,744 BLM-administered surface acres and 253,357 subsurface acres). Since the BLM has no control on other lands in the planning area, some adverse cumulative impacts may occur regardless of BLM actions. About half of all lands in PPAs would receive adequate protection for sage-grouse, the other portions in the high to moderate oil and gas development area (private land in the northern portion of PPAs) may receive a level of development on private lands that is detrimental for sage-grouse regardless of BLM actions (refer to Map 2-4 for Greater Sage-Grouse PPAs and Figure 4-1 for a display of the oil and gas development potential).

There are few areas where incremental development would be avoided and wildlife habitat in the very low development potential area would remain at risk as the percentage of lands affected by development continue to increase throughout the life of the plan.

Wind energy development would be excluded from 118,904 acres and avoided on 78,636 acres of BLM surface ownership, and other ROWs would be excluded on 5,836 acres and avoided on 191,704 acres of BLM surface ownership which would limit the cumulative impact from wind development in those areas. However, Alternative D does identify management actions that would not fragment important habitat areas.

While some loss of habitat for sensitive status species would continue on other lands, loss of habitat on BLM-administered lands would be minimal under Alternative D. Actions provided in Alternative D would have beneficial impacts on sensitive species by providing adequate protective measures in and around important habitat and limiting disruptive activities during critical periods on BLM-administered lands.

Fish and Aquatics

Aquatic resources are directly or indirectly affected by a multitude of land use activities throughout the planning area, particularly activities that affect water quality/quantity and erosion/sedimentation. Some of these activities include livestock grazing, agricultural practices, water withdrawal or diversion, road construction and maintenance, soil disturbances during land development activities, logging, OHV use, renewable energy development, mining, and oil and gas exploration and extraction activities. Impacts could include loss of habitat, disturbance during critical life cycle periods (i.e., breeding/spawning), and degradation of water quality conditions or movement of fish and other aquatic species. The evaluation of all projects for aquatic potential and management actions to improve vegetation, soils, riparian areas, and minimize surface disturbance would likely have beneficial effects on adjacent aquatic resources.

Guidelines and Assumptions

Implementation of each alternative could affect fish and aquatics and their habitats. Effects may be direct, indirect, short-term, long-term, beneficial and/or adverse. Natural events and human activities that influence water quality and water quantity can produce beneficial or adverse effects on fisheries habitats. Direct effects can result from disturbances within fish habitats, while indirect effects result from offsite activities that change water quality or quantity within fish and aquatic habitats. Management actions that transport sediment to and through streams and reservoirs increase deposition and could adversely affect fish and aquatic species. Effects on fish and fish habitats can be highly variable based on soil types, slope, aspect, and amount and types of vegetative cover.

Species presence in fisheries reservoirs is determined by SDGFP stocking programs, illegal stocking, or natural dispersal by other wildlife. The BLM provides input to stocking program administration, but has little means of influencing other fish dispersal into reservoirs. Fish may occur in lakes and reservoirs without the BLM's knowledge, and there is no way of analyzing potential effects of management actions on those fish and fish habitats. Actions that protect upland and shoreline vegetation and improve fish habitat conditions in known lake and reservoir fisheries are beneficial. BLM actions include implementation of Standards and Guidelines, use of Streamside Management Zone (SMZ) buffers for forestry BMPs (Appendix B), restrictions limiting surface occupancy in riparian areas, and restrictions that protect water quality (Table 2-1).

Fish-bearing streams are very important because of their connection to larger streams and rivers that provide corridors for fish movement. These stream courses cross a variety of land ownerships and flow past various management actions which can affect the quality of habitat. Periods of long-term drought result in reduced flow levels which can result in reduced numbers of fish or fewer types of fish. Recolonization of clear pool-type habitats after the drought may take years to occur.

Assumptions and guidelines used in this impact analysis include the following:

The BLM is responsible for managing habitats, whereas state (SDGFP) and federal (USFWS) fish and wildlife management agencies oversee management of fish species. Therefore, to analyze potential effects to fish habitats this discussion primarily relies on changes to riparian vegetation, stream banks, in-stream habitats, channel erosion, migration corridors, and water quality and quantity.

Activities that cause substantial disturbance to soils and vegetation may adversely impact water quality and quantity, which adversely affects fisheries and aquatic species habitats.

Surface disturbances accelerate runoff and sediment delivery to stream channels which alters flows and reduces habitat quality for fish and aquatic species that require clear water, moderated stream flows, and clean substrates.

Increased sedimentation adversely affects most fish species in the planning area. This analysis, therefore, focuses on the surface disturbance anticipated to occur under each alternative.

Activities affecting water quality are regulated by the South Dakota Department of Environment and Natural Resources (DENR).

The potential for sedimentation of reservoirs, streams and rivers is minimized through use of current BMPs and implementation of Standards and Guidelines.

Alternatives proposing to (a) improve fish passage, (b) reduce fish mortality, (c) reduce surface disturbance, (d) improve riparian areas, (e) reduce erosion, (f) improve water quality and quantity, and (g) design survey and monitoring programs for aquatic habitats are anticipated to have the most beneficial effects on aquatic species.

Management actions potentially affecting fish, fish habitats, and aquatic species and their habitats include surface-disturbing activities (mineral extraction, renewable energy development, ROWs for surface-disturbing activities such as roads and pipelines), livestock grazing, and riparian management improvement projects. Potential effects on aquatics and fisheries generally occur due to changes in (1) water quality, and (2) water quantity due to the limited number of fish-bearing and perennial stream segments occurring on BLM-administered lands.

Proposed management of the following resources/resource uses/programs would have little effect on fisheries: air quality, geology, cultural resources, paleontological resources, visual resources, recreation, and special designations. A majority of fish-bearing stream and river mileage in the planning area is on private land. The BLM has little influence on resource values and uses of private land. Activities on private land that decrease water flow or water quality may affect the quality of riparian and aquatic habitat on BLM-administered land downstream of the private land.

Under all alternatives, forestry and fire and fuels management would use a mandatory 50-foot setback restricting disturbance to vegetation and soils along perennial streams (streamside management zones, as discussed in the BMP summary (Appendix B). Wildfire impacts to the fisheries and aquatic resources are usually short-term and managed under fire rehabilitation plans. Effects of new roads (energy development and ROWs) on fish-bearing streams are covered under surface-disturbing activities. OHV use for administration of the public lands is sporadic and nearly impossible to analyze on a site-specific basis. Effects of roads and trails crossing ephemeral/intermittent streams are discussed in the Water Resources and Travel Management sections. Land tenure adjustments under the various alternatives require site-specific evaluations of BLM land disposal proposals. Any proposal to dispose of BLM land along a fish-bearing stream would be evaluated by the appropriate specialists. The above actions with minimal adverse effects will not be analyzed further.

Comparisons of surface disturbance statistics to indirect effects on fisheries or aquatics and their habitats by alternative are not straightforward. The spatial relationship of the disturbance to fish-bearing streams is critical because a large acreage of disturbance farther from a stream/river would be less critical than a small acreage of disturbance closer to a stream/river. The largest adverse effect could come from a non-maintained road crossing a small stream which may increase the amount of sediment in the stream. If the following winter has little moisture and there is no flushing of downstream spawning/riffle areas the following spring there would be decreased habitat. For these reasons, comparing alternatives is made in general terms rather than by discussion of effects by acres.

Impacts Common to All Alternatives

The extent of activities affecting aquatic resources (fish, aquatic invertebrates and fish habitat) and the dispersed distribution of BLM lands limit the ability of BLM management decisions to substantially impact aquatic resources throughout the planning area. Rivers and streams are linear habitats that pass through multiple land ownerships. Therefore, areas where interagency or interdisciplinary management plans or cooperative agreements have been or could be implemented have the greatest potential to substantially improve aquatic resource conditions over time. To limit impacts to fisheries and water quality, an NSO stipulation would apply under all alternatives within 1/4 mile of reservoirs with fisheries. The NSO would reduce the potential for contamination of water and adverse impacts to fisheries and aquatic species.

Aquatic habitat would benefit from increased efforts to implement recovery plans, State of South Dakota management plans, and conservation strategies for special status species that require aquatic or riparian habitat. Conservation and

protection of habitat for special status fish species would benefit all aquatic species. Improvements in watershed level habitat management would benefit fish and other aquatic species.

Efforts to improve habitats with habitat improvement projects and more consistent and intensive monitoring programs throughout the planning area would have a long-term beneficial impact. Implementing habitat improvement projects is expected to continue and would improve aquatic resources across all alternatives.

Climate : Potential changes in climate that would affect temperature and precipitation would affect aquatic species and their habitat. Changes to seasonal weather patterns, ambient air temperatures, carbon levels, and the timing and amount of precipitation could result in direct, long-term impacts to many aquatic species. Since the specific type or degree of changes to climatic conditions is not fully understood at this time, determining impacts to individual species over the next 20 years is very difficult. Aquatic species may be impacted by changes to vegetation that may occur through climate change. Changes to vegetation would alter habitat quality and quantity and water quality. Management actions would build resilience to systems, prevent communities from passing thresholds, improving the ability of aquatic species to adapt to changing conditions.

Water Quality: Changes in water quality occur through increased erosion, changes in water chemistry (i.e., temperature, salinity, dissolved O_2, and pH), and from hazardous chemical spills (i.e., oil, gas, fertilizer, non-point, etc.) causing direct and indirect short-term adverse effects to aquatic species.

Increased erosion can cause mortality or reductions in populations of aquatic species through increasing turbidity, changing channel substrate composition, filling in pools, degrading aquatic cover, and degrading rearing and spawning habitats. Erosion can be accelerated by riparian and upland vegetation removal, soil compaction and disturbance, improper logging practices, improper reservoir construction, wildfire, improper mining activities, improper grazing practices, improper OHV and other recreational use, and improper road development. BMPs mitigate a lot of this erosion potential. BMPs that promote increased riparian vegetation, improved streambank stability, decreased soil disturbance and compaction, improved road drainage, limited OHV use, and rehabilitation of disturbed sites would decrease long-term erosion potential and improve fish populations and habitats.

Potential effects from changes in water chemistry include direct mortality, habitat avoidance, altered forage availability, and reduced species diversity. Typically, these effects occur through changes in water temperature, salinity, dissolved oxygen, nutrient loading, and pH. These actions can result from improper reservoir construction, reduced riparian vegetation from grazing, water discharge from oil and gas activities, mining practices, and filling of sediment in reservoirs (lack of reservoir depth). Implementation of BMPs mitigates much of the water chemistry concerns. BMPs that promote project improvements, avoidance of sensitive areas, and active restoration/enhancement of habitats would decrease potential adverse effects from changes in water chemistry.

Hazardous chemical spills related to BLM actions are mitigated through BMPs that require spill prevention plans. Increasing gas production, adding pipelines, and increasing development could increase the risk of hazardous chemical spills.

Water Quantity: Changes in water quantity can occur through changes in stream flows, reservoir construction in uplands, and irrigation withdrawal.

Aquatic species can be adversely affected by changes in stream flows. Wildfire and improper logging, grazing, and road drainage practices can increase peak flows causing both flooding and decreased base flows. Effects of flooding are noticeable through increased erosion, removal of riparian vegetation, and changes in streambed substrate. Decreased flows can affect habitat availability, forage, and water chemistry. In both stream flow cases, direct mortality can also result.

Low flows from irrigation withdrawals are outside BLM management control. Water rights are managed through the South Dakota DENR.

Large reservoirs (over 15 acre feet) on rivers and streams and numerous small reservoirs in uplands can influence stream flows; however, reservoirs on large rivers and streams are typically outside BLM management control as they are mostly located on private lands or lands administered by other agencies. Numerous small reservoirs in upland drainages are suspected to cause decreased stream flows in downstream fish-bearing streams. It is difficult to quantify the long-term

effect of these reservoirs and their water holding capacity on stream flow downstream. Reservoir projects would be evaluated for potential to improve the aquatic resource resulting in a long-term beneficial effect on adjacent aquatic resources.

Aquatic Habitat: Healthy aquatic habitat is essential for healthy native and game fish populations and other aquatic species. Quantity and quality of pools, adequacy of fish cover, and quality of spawning substrate are all important habitat components influencing the size and diversity of fish and other aquatic species populations. Many management activities would have both short-term and long-term adverse effects on aquatic habitat. Accelerated erosion can fill in pools and fishing reservoirs and destroy spawning substrate. Riparian vegetation removal can decrease fish cover and destroy habitat. Increased peak flows can change the complexity of habitats and damage streambanks and riparian vegetation. Management actions that mitigate or prevent these effects increase the size and diversity of game and native fish species. The BLM can promote fisheries through habitat restoration and enhancement, improvements in water quality and quantity, improvements in fish passage devices, screening of water diversions, aggressive access programs (signs, easements), and increased public education and interagency coordination.

Direct Mortality Issues: Direct mortality to aquatic species occurs from (1) sport fishing, (2) changes in species composition, (3) human caused migration barriers, and (4) disease. Sport fishing is managed by SDGFP and is outside BLM management control. Changes in species composition often result from SDGFP management, illegal and inadvertent public stocking, natural augmentation such as when fish eggs are transported in birds' feathers, or by changes in water quality or aquatic habitat. Changes in water quality and/or aquatic habitat, such as increased turbidity and water temperature, could cause direct mortality of a species or create more favorable conditions for one species over another. Collecting data on streams and reservoirs through surveys and monitoring of water quality, stream biota, riparian health and sampling of fisheries allows a greater knowledge of the resource and help in making appropriate management decisions.

Human-caused barriers, typically culverts and fords, often prevent fish migration up or down stream. This can result in loss of habitat, blocking fish movements to spawning areas, and loss of foraging and rearing areas. Mortality can occur to several life stages of fish depending on habitats excluded from fish migration corridors. Development of road or trail crossings that would not inhibit fish or other aquatic species would be beneficial.

Undesirable spreading of disease and invasive species can be reduced through implementation of BMPs for aquatic invasive species containment protocols. Utilizing the Integrated Pest Management (IPM) concept to control infestations of terrestrial and aquatic invasive species would be beneficial to the associated species and habitat across all alternatives.

Special Status Species Fish: Effects to special status fish species would be similar to those effects projected for other fish species, as described above. BLM management decisions would not jeopardize the continued existence of listed, officially proposed for listing, or candidates for listing as threatened and/or endangered species by the ESA. Habitat for candidate species would be managed for protection from actions that would contribute to the species being listed under the ESA. Habitat for other special status species would be managed to protect them and their habitats from loss in accordance with guidance provided by federal, state and local regulations, with particular emphasis placed on maintaining, restoring, and enhancing habitat for all special status species.

Impacts under Alternative A (Current Management)

Current management under Alternative A has an oil and gas NSO lease stipulation in floodplains and around major water bodies to limit surface disturbances in these sensitive areas (13,397 surface acres and 63,426 subsurface acres). This is less restrictive than Alternatives B, C, and D. Total acres of surface disturbance in Alternative A would be higher than in Alternatives B and C because there would be more development, increasing the potential for sedimentation in nearby fish-bearing reservoirs or streams. Effects would be similar whether streams flow into a river or into a reservoir containing fish and aquatic habitat. Riparian areas would be managed to achieve a healthy and productive ecological condition or PFC for maximum long-term benefits and values within site capability. This would improve fish and other aquatic species habitat.

Alternative A would have more potential to decrease water quality, water quantity, and aquatic habitat than Alternatives B and C. Surface-disturbing activities could contribute to decreased water quality through increased erosion potential, increased riparian disturbance potential, increased vegetation removal, increased potential for sedimentation, and a higher

potential for catastrophic fire. Fisheries effects in Alternative A would include direct mortality resulting from changes in species composition and creation of human-caused movement barriers.

Impacts under Alternative B

Alternative B has moderate resource development and has more acres managed for NSO (105,837 surface acres and 404,306 subsurface acres) than Alternative C (more acres were closed). NSO would be required on soils with a severe erosion hazard and in areas with badlands, rock outcrops, or slopes susceptible to mass failure. Oil and gas, renewable energy, and ROW activities would be prohibited from riparian areas, floodplains, lakes, ponds, rivers, streams, and other water bodies that would protect fish-bearing habitats and other aquatic resources.

Riparian areas would be managed to achieve a healthy and productive ecological condition or PFC for maximum long-term benefits and values within site capability. This would improve fish and other aquatic species habitat.

Alternative B has a moderate approach to resource protection and would provide the same protections for fish and aquatic species passage as Alternative C. All actions would have long-term, beneficial effects on aquatic resources by improving habitat and decreasing direct fish mortality. Alternative B would have fewer effects to water quality, water quantity, and aquatic habitat than Alternative A and more effects than Alternative C. In comparison to Alternative A, this would occur through decreased erosion potential, decreased riparian disturbance potential, decreased vegetation removal, decreased potential for sedimentation, and less potential for catastrophic fire. In comparison to Alternative C, this would be due to increased erosion potential and increased oil and gas, renewable energy, and other commodity activities.

Alternative B would have fewer adverse effects than Alternative A in relation to mortality, with more input for potential changes in species composition and enhanced fish passage past human-caused movement barriers made passable for fish and other aquatic species. Alternative B would have more adverse effects than Alternative C in relation to fish mortality, specifically with changes in species composition and human-caused movement barriers.

Impacts under Alternative C

More acres would be closed in Alternative C, 100,160 surface and 309,576 subsurface acres, than for any of the other alternatives. In addition, areas managed for NSO in Alternative C would include 43,897 surface acres and 355,396 subsurface acres. NSO would be required on soils with a severe erosion hazard, and in areas with badlands, rock outcrops, or slopes susceptible to mass failure. Renewable energy and ROW activities would be excluded within 1/4 mile of reservoirs with fisheries, which is more restrictive than in Alternatives A or B. This results in fewer adverse effects to fish and aquatic resources. Restrictions would reduce the likelihood of large amounts of sediment flowing into fish-bearing streams or fisheries reservoirs. Riparian areas would be managed to achieve a healthy and productive ecological condition or PFC for maximum long-term benefits and values within site capability. This could improve fish and other aquatic species habitat. Alternative C would provide more protection for fish and other aquatic species than Alternatives A or B.

Alternative C would emphasize more protection of resources rather than development and commodity production. Alternative C would have less adverse effect on water quality, water quantity, and aquatic habitat than Alternatives A or B. The potential would decrease for erosion, riparian disturbance, vegetation removal, sedimentation, and catastrophic fire.

Alternative C would have decreased adverse effects (compared with Alternative A) in relation to mortality, more input into potential changes in species composition, enhanced fish passage past human-caused movement barriers , potential for off-site mitigation and mitigation for new structures to enhance riparian function. In addition, this alternative has greater potential for increased beneficial effects to water quality, quantity and aquatic habitat, which influence aquatic species composition.

Impacts under Alternative D (Preferred Alternative)

The potential direct and indirect effects from Alternative D on aquatic resources could result from circumstances dealing with water quality, water quantity, aquatic habitat, and/or other direct mortality issues as mentioned above. Alternative D, similar to Alternative B, has moderate resource development and would therefore have fewer acres managed for NSO (107,025 surface acres and 406,005 subsurface acres) than Alternative C. NSO would be required on slopes greater than 50

percent. Oil and gas, renewable energy, and ROW activities would be prohibited from riparian areas, floodplains, lakes, ponds, rivers, streams and other water bodies which would protect fish-bearing habitats. Some protection to aquatic habitats would occur through CSU constraints on oil and gas activity, renewable energy development and ROW development on soils with a severe erosion hazard, and in areas with badlands, rock outcrops, or slopes susceptible to mass failure to minimize erosion concerns.

Riparian areas would be managed to achieve a healthy and productive ecological condition or PFC for maximum long-term benefits and values within site capability. This would improve fish and other aquatic species habitat.

Alternative D has a moderate approach to resource protection and enhancement. Alternative D would have fewer adverse effects to water quality, water quantity, and aquatic habitat over Alternatives A and B. This would occur through decreased erosion potential, decreased riparian disturbance potential, decreased vegetation removal, decreased potential for sedimentation, and less potential for catastrophic fire. Adverse effects would be greater, however, than in Alternative C. This would be due to decreased erosion protection and increased oil and gas, renewable energy and other commodity activities that increase potential for indirect adverse effects.

Alternative D would have decreased effects (compared with Alternative A) in relation to mortality, with more input into potential changes in species composition and enhanced fish passage past human caused movement barriers.

Cumulative Impacts

Cumulative Impacts under Alternative A (Current Management)

Surface disturbance in Alternative A would lead to greater effects when added to surface disturbance activities on private lands with more lenient restrictions. Cumulative impacts would also result from a combination of BLM resource uses that include transportation, oil and gas production, recreation, livestock grazing, ROWs, OHV use, and high intensity wildfire.

Oil and gas development on private surface and split estate minerals could result in conversion of a maximum of 392 acres of short-term disturbance on other lands in the nine-county area. Oil and gas development on private surface and split estate minerals is expected to result in a maximum of 237 acres of long-term surface disturbance. Development of other BLM-administered minerals is expected to result in a maximum of 400 acres of short-term disturbance and 100 acres of long-term disturbance in the nine-county area. Bentonite and gravel mining would account for most of the acres disturbed. This will not vary greatly from alternative to alternative.

Alternative A lacks the constraints that help reduce effects from these activities. These impacts, when combined with the existing condition (natural environmental conditions, private land ownership and other private activities, and past activities on federal lands) would cause both short-term and long-term adverse effects to fish and aquatic species.

Cumulative Impacts under Alternative B

Cumulative adverse effects in Alternative B result from a combination of BLM permitted activities that include transportation, oil and gas production, renewable energy, recreation, livestock grazing, ROWs, OHV use, high intensity wildfire, past oil and gas production, and activities on the surrounding private land. Alternative B has less proposed mitigation, habitat monitoring, and protection measures resulting in fewer beneficial long-term effects than Alternative C.

Cumulative Impacts under Alternative C

Resource protection measures in Alternative C reduce the cumulative impacts resulting from a combination of BLM resource uses that include transportation, oil and gas production, recreation, livestock grazing, ROWs, OHV use, and high intensity wildfire. Alternative C also has proposed mitigation, habitat monitoring, and protection measures that help reduce the effects from resource uses and activities. These cumulative impacts, when combined with natural environmental conditions, private land activities, and past activities on federal lands, are less adverse than in Alternatives A and B. However, existing oil and gas well development and ROWs on BLM land built under fewer constraints under past management, combined with oil and gas well development on private land with fewer constraints and any future such actions on private land still may cause problems for aquatic resources.

The ACEC designation, combined with closure/withdrawal of minerals and ROW exclusion offered by Alternative C for Greater Sage-Grouse PPAs, results in beneficial and adverse trade-offs in terms of impacts to aquatic species in areas on or near Greater Sage-Grouse PPAs by protecting BLM-administered lands in PPAs while potentially concentrating use and infrastructure on private lands or onto non-federal lands within PPAs or onto other lands adjacent to PPAs. When this type of use or infrastructure is moved to lands not managed by the BLM, the BLM loses the ability to mitigate impacts, control management of hazardous materials, and implement BMPs and other conditions. Additional discussion of these trade-offs is provided in the cumulative impacts sections of wildlife and special status species.

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D reflects a balanced level of resource development with conservation of sensitive finite resources and long-term productivity of renewable resources. Cumulative impacts resulting from a combination of BLM resource uses that include transportation, oil and gas production, recreation, livestock grazing, ROWs, OHV use, and high intensity wildfire would add to effects of previous resource uses that had fewer constraints. Alternative D has proposed mitigation, habitat management practices, and protection measures that would help reduce the adverse effects from these activities. However, these measures are less protective than in Alternative C, and more in line with Alternative B. These cumulative impacts, when combined with natural environmental conditions, private land activities, and past activities on federal lands, are less than in Alternative A, but more than in Alternative C.

Cultural Resources

The criteria for assessing potential impacts to cultural resources are those stipulated in the regulations for Protection of Historic Properties (36 CFR §800). These regulations state that an undertaking (refer to the Glossary for definition) may have an effect when it may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR §800.5(a)(1)).

Examples of potential effects include:

- Physical destruction, damage, or alteration of all or part of the property;
- Property alteration that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR §68) and applicable guidelines;
- Removal of the property from its historic location; and
- Disturbing the visual setting of an historic property, such as in the case of a Traditional Cultural Property (TCP).

Assumptions

Impact analysis assumptions for cultural resources include the following:

Discoveries of cultural resources would continue throughout the planning area.

A direct correlation exists between the number of sites that could be impacted by various actions and the degree, nature, and quantity of surface-disturbing activities within the planning area.

A direct relationship exists between the frequency of human use in an area and the potential for cultural resources to be impacted.

Protection for all cultural resources would occur according to federal laws and BLM regulations and agreements, regardless of whether resources are specifically identified in the RMP.

The BLM would continue to mitigate impacts to cultural resources from authorized uses through project abandonment, redesign and, if necessary, data recovery investigations in accordance with federal laws and BLM regulations.

All archaeological resources would be assessed according to BLM Use Categories.

From a cultural resource perspective, the potential transfer of up to 170 acres of BLM-administered surface estate near Interstate 90 in the Fort Meade ACEC to the Department of Veterans Affairs for expansion of the Black Hills National Cemetery, as described in Alternatives A, B, and D, is considered an administrative action. The Department of Veterans Affairs is a federal agency that is under the same regulations (NHPA), as BLM. Hence, it is not considered to have an effect or be an affected action to cultural resources.

Impacts Common to All Alternatives

Cultural resources would be impacted by surface and subsurface-disturbing activities. Activities that involve the use of heavy equipment (road construction, well drilling, pad construction, pipeline, and utility placement) and result in changes to the natural landscape would cause the greatest surface and subsurface disturbance. These activities would have the greatest effect on cultural resources. Other activities such as increased travel and vandalism, resulting from access improvements and increased erosion resulting from surface disturbances, would also impact cultural resources. Noise, activity, traffic and smells can affect the quality and continued use of TCPs by creating distractions from the traditional values and uses associated with TCPs.

The proactive inventory and management of historic properties in the planning area would create a beneficial effect to cultural resources, as cultural resources would be identified and appropriately managed.

Energy and Minerals: Development of energy resources would have a direct effect on cultural resources from road construction, use, and maintenance, well development, material mining and extracting; visual quality impacts and noise increases to TCPs, and fragmentation to Cultural Landscapes and Districts from well developments and associated roads.

The preference for oil and gas companies to conduct small block surveys (10 acres) for well proposals (cultural resource inventories), combined with the BLM's preference for avoiding all cultural sites has created a patchwork network of cultural resource information based on what has been reviewed for Cultural Resource reports on Oil and Gas projects in North Dakota. The small block survey approach has the potential to create challenges for recording oil and gas projects. In an effort to avoid sites within the small 10-acre blocks, several cultural sites recorded over the years may be linked to other sites, yet these sites could be one large site rather than several small sites. As a result of the small-block surveys, these larger sites have been dissected by pipelines, roads, and wells. This creates an adverse visual setting for the cultural resources within high and moderate oil and gas development potential areas. It may also lead to adverse effects to the visual setting in low development potential areas. Larger block surveys on the ground and a more quantitative approach to the Class I reviews when determining avoidance methods would improve evaluation methods of the properties and landscape. Given the limited oil and gas development in the planning area, this is not likely to become a concern in South Dakota, except in areas of high oil and gas potential.

Fire Management and Ecology: In some instances, cultural or historic sites could be damaged or destroyed when fire suppression efforts are critical to protect human life or property. The types of adverse effects expected to occur from wildfire suppression efforts are damage and/or destruction to historic buildings from fire and dozer impacts to surface and/or buried cultural sites. Under standard protocols, impacts to known cultural resources would be considered and mitigated. Additionally, the aerial application of fire retardant would be restricted over areas that contain petroglyphs and pictographs. Incident base camps, staging areas, helibases, and other incident management activities would be placed outside of and sufficiently distant from known or identified cultural resource areas.

Fire rehabilitation efforts would generally increase the protection of cultural sites that may have remained unaffected from wildfire by preventing or reducing erosion and encouraging rapid revegetation of denuded surfaces. Potential impacts from rehabilitation activities, such as mechanical reseeding, would be mitigated under standard procedures and BMPs (Appendix B).

Surface disturbance from both wildfire and fuels management activities occurs most often when full suppression is required. During full suppression the likelihood of ground disturbance increases when the use of bulldozers, hand-cut trenches, and large water pumper trucks are necessary. This would most likely be the case during a wildfire situation, but could occur during a prescribed fire if conditions are such that a wildfire could ignite. Potential adverse effects such as archaeological sites being damaged and/or destroyed during a prescribed fire would be reduced by mitigation efforts set forth in Section 106 of the NHPA.

It is anticipated that both wildfire and prescribed fire could occur in the planning area over the life of the plan. Natural and prescribed fire could damage sites composed of combustible materials. Potential adverse effects to cultural resources from fuels management projects would be minimized by pre-planning and Section 106 (NHPA) mitigations. Fuels treatment projects would minimize wildfire potential, therefore minimizing potential adverse effects to cultural resources. Prescribed fire also offers better ground surface visibility for post-burn inventories, increasing the likelihood for finding and protecting additional cultural resources.

Lands and Realty: Acquiring new access to BLM land would have a long-term indirect adverse effect of exposing cultural resources to increased damage from illegal collection of artifacts and vandalism. The issuance of ROWs, leases, and permits that result in surface-disturbing activities could cause direct, indirect, or inadvertent impacts to cultural resources. Direct impacts would be mitigated under standard avoidance or recovery procedures. Indirect or inadvertent impacts would likely be minimal and perhaps proportional to the number and extent of ROWs, leases, and permits issued annually.

Livestock Grazing: Grazing management that meets established Standards and Guidelines would reduce the amount and extent of impacts to cultural resources from grazing on BLM land. While direct impacts associated with range improvement projects would be mitigated, other impacts may occur as a result of livestock grazing. Livestock congregation and trailing at or across cultural resource site locations can damage artifacts and the contexts in which they occur. Cattle shading and rubbing can damage standing historic structures and prehistoric pictograph panels. Trampling at spring sources, salt licks, and along stream banks; cattle trailing; and overgrazing can all lead to a denuding of protective vegetation cover. This creates indirect impacts to cultural resources by accelerating natural erosion and exposing artifacts to illegal surface collection and/or vandalism. These impacts would likely be localized at particular sites and could range from short- to long-term to irreversible.

OHV Use and Travel Management Areas: Developing new or upgrading existing transportation facilities could result in the permanent mitigated loss of cultural resources. Increased accessibility to cultural resources could lead to vandalism and unauthorized collection of artifacts. However, increased access could also better facilitate the traditional use of sacred locations by Native Americans.

Recreation: Impacts from dispersed recreational activity (camping, hiking, horseback riding, mountain biking, OHV use) are difficult to assess, particularly because these activities may impact cultural resources that have not yet been identified and recorded. Indirect and inadvertent (unintentional) adverse impacts to cultural resources may occur by attracting additional attention or visitation to certain areas such as SRMAs. Visitation and recreational use can lead to illegal collection of artifacts and/or vandalism. Providing recreational use or public interpretation of cultural and historic resources may enhance appreciation and understanding of their fragile and finite nature and offer cooperative efforts for site protection through monitoring. Similarly, promoting adaptive reuse of historic buildings and structures for recreation would help preserve and protect significant historic properties, helping fulfill requirements of Section 110 of the NHPA.

Renewable Energy: Renewable energy has the potential to affect cultural resources because of the high degree of surface disturbance required during construction. Additionally, viewsheds of Native American cultural sites and TCPs would be directly affected by large wind projects. Based on high wind potential locations, cultural resources could be impacted by projects proposed in the northwest quarter of the state, the Badlands area, and the Black Hills Exemption Area. Anticipated effects, however, could be minimized or eliminated through avoidance and mitigation actions.

Solid Minerals: Surface-disturbing activities associated with leasable and salable mineral exploration and development could result in adverse impacts to cultural resources from vehicle and equipment use, construction, and maintenance of facilities. In addition, the potential for indirect and inadvertent impacts would increase proportionally to the amount of land available for leasable and salable mineral exploration and development. Although opening lands for mineral exploration could have a direct impact on cultural resources, impacts would be mitigated under standard avoidance or recovery procedures.

Abandoned mine land reclamation and remediation would have a direct impact on historic mining features and properties. These impacts may be mitigated through additional data recovery, recordation, and photo documentation. However, the impacts of comprehensive reclamation and remediation programs on historic mining districts and landscapes may be difficult to assess and may be more cumulative in nature.

Surface-Disturbing Activities: The greatest risk of damage or destruction of cultural resources across all alternatives results from unauthorized activities such as recreation, OHV use, vandalism and natural processes (natural decay, deterioration, or erosion). Under all alternatives, unquantified indirect impacts would occur. Management activities occurring within the planning area are not expected to affect cultural resources outside of the planning area.

Surface disturbance, including 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 effects to cultural resources from proposed activities would include destruction, damage or alteration to all or part of the cultural resource; visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features; and transfer, lease, or sale of a property out of federal ownership or control.

Under all alternatives the BLM would continue to mitigate impacts to cultural resources from authorized uses through project abandonment, redesign, and if necessary, data recovery investigations. However, cultural resources would continue to deteriorate through natural agents, unauthorized public use, and vandalism.

Impacts under Alternative A (Current Management)

Fire Management and Ecology: A total of 346 acres would receive mechanical fuels treatments and 213 acres would be treated by prescribed fire annually over the life of the RMP. This would result in a potential effect to three cultural resource sites based on the one site per 175 acres assumption presented in Chapter 3. Adverse effects from these activities would be mitigated under standard NHPA, Section 106 procedures for all cultural resource sites. Prescribed fire and mechanical fuels treatments would be utilized to promote a healthy landscape and reduce wildfire potential. A healthy landscape would also help protect historic properties from wildfire and fire suppression activities.

Forest and Woodland Products: Alternative A estimates the PSQ would be approximately 7,000 tons/year for all forest and woodland products. New roads would be constructed to the minimum standard needed to access available forest products. Adverse effects from these activities would be minimal because they would be mitigated under NHPA, Section 106 procedures.

Fluid Minerals: Surface disturbance that can reasonably be predicted to occur from leasing and developing subsurface fluid minerals includes well pad construction, drilling, road construction, pipeline construction, vehicular travel during construction, well maintenance and reclamation. These surface-disturbing activities should not have an adverse effect on historic properties if the properties are located, recorded, and either avoided or mitigated prior to construction.

Alternative A has the least number of acres of restrictions and therefore would have the most potential for affects to cultural resources. Approximately 6,894 acres would be closed to fluid mineral leasing; 15,489 surface acres and 87,349 subsurface acres would be open subject to NSO lease stipulations; and 2,954 surface acres and 19,613 subsurface acres would be open to leasing subject to CSU stipulations, which would protect those BLM acres from oil and gas development throughout the planning area. The protective measures would have a beneficial effect on cultural resources and TCPs on BLM land. The closed and NSO stipulations would offer protection to an estimated 128 cultural resource sites for surface acres and 539 cultural resource sites for subsurface acres (based on the one site per 175 acre assumption presented in Chapter 3).

The Fort Meade ACEC, which has National Register of Historic Places listed eligible historic properties, is closed to leasing. The Fossil Cycad ACEC is closed to leasing. All other areas proposed for leasing would be subject to standard stipulations with a Cultural Notice, which would still require mitigation such as an intensive inventory, avoidance, or excavation under NHPA, Section 106. It is not anticipated that historic properties would be directly adversely affected because of mitigation through the NHPA, Section 106 process, although there is a high concern for impacts to the cultural landscape with small block surveys, as these surveys do not reveal a comprehensive understanding of cultural resources that may be present.

Lands and Realty

Land Tenure Adjustment: Lands identified for retention and acquisition within ACECs would have a beneficial effect for cultural resources. The Fort Meade ACEC is identified for cultural values. Acquiring private land adjacent to this ACEC would contribute to the value of the ACEC and potentially to the historic integrity of the sites within. No lands are

identified for acquisition adjacent to the Fort Meade ACEC, providing less protection to cultural resources than the other alternatives. A land transfer of up to 170 acres to the National Cemetery is considered in Alternative A. This would not result in effects to cultural resources because it is considered an administrative action only. The Department of Veterans Affairs is obligated to provide protection to historic properties according to the National Historic Preservation Act, the same as the BLM.

Right-of-Way and Avoidance Areas: The Fort Meade ACECs is an avoidance area under Alternative A. ROWs may be granted in avoidance areas or restricted corridors only when no feasible alternative routes and/or sites are available. In avoidance areas, ROW stipulations from BLM Manual Handbook H-2801-1 would be used to protect resource values, including visual qualities. Construction activities such as transmission lines and/or new roads could impact cultural resources on the ground in addition to creating a visual intrusion to the cultural viewshed. Alternative A offers the fewest restricted acres with 5,522 acres excluded, and 267,768 acres open. This provides the least protection to cultural resources.

Withdrawal: Alternative A does not propose withdrawal of federal minerals for development beneath Bear Butte National Historic Landmark, providing less protection to cultural resources than Alternatives C and D.

OHV Use and Travel Management Areas: Alternative A offers less protection to cultural resources than Alternatives C and D and more than Alternative B. Alternative A continues current travel management designations limited to existing roads and trails on 264,706 acres and limited to designated roads and trails on 6,894 acres in the ACECs. Motorized travel would be allowed within 300 feet of roads to access a campsite. Cross-country motorized travel for big game retrieval would not be allowed. OHV activities can affect cultural resources if these uses cause vegetation loss, soil exposure, or erosion in areas where NHPA, Section 106 compliance surveys and assessment of effects has not been completed. Off-road motorized travel may cause inadvertent damage to cultural resources and allow more opportunities for illegal vandalism and looting of sites.

Renewable Energy: Alternative A has very few acres of restrictions, including 5,522 acres excluded and the remaining 267,768 acres open. The restriction offers better protection to an estimated 32 cultural resource sites (based on the one site per 175 acres assumption presented in Chapter 3). The remaining land in the planning area, including ACECs, TCPs and NRHP-eligible sites, is open to wind energy development. The addition of either wind turbines or transmission lines in these areas could have adverse effects to cultural resources. The viewshed associated with ACECs, TCPs and National Register eligible sites could be adversely affected by installation of wind turbines and/or transmission lines. Surface-disturbing activities could be mitigated through the Section 106 process, but the viewshed could not be mitigated. Under this alternative, no special protection would be afforded these sites except mitigation under NHPA, Section 106.

Solid Minerals: Currently, the only surface disturbance from mining for solid minerals is the bentonite mining northwest of Belle Fourche in Butte County and a portion of the Wharf Gold Mine near Terry Peak in the northern Black Hills. It is unknown how many archaeological sites were lost to the century-long gold and silver mining in the Black Hills. The Exemption Area has a high density of historic properties throughout the Exemption Area that are primarily related to historic mining, making it difficult to assess how many archaeological sites could have been destroyed by mining activities. Presently, there is a withdrawal for solid minerals for the Fort Meade and Fossil Cycad ACECs, and the rest of the planning area is open to mineral entry under the 1872 Mining Law.

Due to the potential for damage and/or destruction of cultural and sacred sites from mining activities such as excavation, road construction, material stockpiling, and associated infrastructure construction, this alternative would have an indirect adverse effect on the visual landscape and potentially a direct adverse effect on cultural and sacred sites. Visual and auditory disruptions would have an adverse effect on TCPs identified in the northwest corner of the planning area, the Black Hills, and the Bear Butte Historic Landmark.

Presently, there is a withdrawal for solid minerals for the Fort Meade and Fossil Cycad ACECs. All remaining land in the planning area is open to salable minerals. Potential adverse effects to cultural resources would be mitigated through inventory, avoidance, or excavation under NHPA, Section 106.

Special Designations: Special stipulations for all ACECs covering oil and gas leasing, solid mineral exploration, renewable energy, certain realty actions, and off-road travel provide more protection for cultural resources in the planning area. Alternative A only prohibits oil and gas leasing and locatable solid mineral entry at the Fort Meade ACEC. Sale treatment of forest and woodland products is prohibited in the Fossil Cycad ACEC. These measures provide greater protection by

prohibiting surface-disturbing activities that threaten to damage and/or destroy cultural resources. A portion of the Fort Meade ACEC (3,200 acres) is presently listed as a NRHP site, offering more protection measures from adverse effects in this part of the Fort Meade ACEC.

Visual Resources: Alternative A would provide the least protection to cultural resources, as no acreage would be assigned to VRM Class I. VRM Class II areas allow very little surface-disturbing activity, and any such activities may be seen, but should not attract the attention of the casual observer. Class II areas are beneficial to TCPs as they are managed for fewer viewshed distractions. Class III and IV areas would be open for development. Cultural resources located in Class II areas (1,204 acres) have a potential to protect an assumed seven cultural resource sites. VRM Class III areas (4,876 acres) have the potential to protect an additional assumed 28 cultural resource sites. Cultural resources located in these areas would receive greater protection than those located in Class IV areas (530 acres) and the remaining undesignated areas (266,706 acres). Proposed surface-disturbing activities in all classes would be subject to mitigation under NHPA, Section 106.

Impacts under Alternative B

Fire Management and Ecology: A total of 400 acres would receive mechanical fuels treatments, and 1,000 acres would be treated by prescribed fire annually over the life of the plan. This would result in a potential effect to eight cultural resource sites based on the one site per 175 acre assumption presented in Chapter 3. Adverse effects from these activities would be mitigated under standard NHPA, Section 106 procedures for all cultural resource sites. Prescribed fire and mechanical fuels treatments would be utilized to promote a healthy landscape and reduce wildfire potential. A healthy landscape would also help protect historic properties from wildfire and fire suppression activities.

Forest and Woodland Products: Alternative B estimates the PSQ would be approximately 7,000 tons/year for all forest and woodland products, the same as Alternatives A, C, and D. Alternative B has the most potential to damage cultural resources because new roads would be constructed for long-term management of areas where multiple entries are anticipated and rerouting and maintenance are specifically authorized. New roads built to access forest products may cause direct adverse effects to cultural resources and indirect adverse effects by allowing access opportunities that could encourage looting and vandalism. Adverse effects from these activities would be moderate because they would be mitigated under standard NHPA, Section 106 procedures.

Fluid Minerals: Surface disturbance that can reasonably be predicted to occur from leasing subsurface fluid minerals includes well pad, drilling, road and pipeline construction, vehicular travel during construction, well maintenance, and reclamation. These types of surface-disturbing activities should not have an adverse effect on historic properties if properties are located, recorded, and either avoided or mitigated prior to construction.

Areas not closed to leasing would be open to oil and gas leasing with NSO, CSU and TL stipulation, all of which can provide protection to cultural sites. Adverse effects to cultural resources from fluid mineral development would potentially decrease in Alternative B. This is based on the following restrictions in the planning area: 6,574 acres would be closed to fluid mineral leasing; 105,837 surface acres and 404,306 subsurface acres would be open subject to NSO; and 10,561 surface acres and 158,501 subsurface acres are proposed with a CSU stipulation. These stipulation areas overlap many areas containing cultural sites, including the Fort Meade and Fossil Cycad ACECs. This would provide added protection to cultural sites by restricting oil and gas exploration and development in areas within and adjacent to important cultural sites. The closed and NSO stipulations would offer protection to an estimated 642 cultural resource sites for surface acres and 2,349 cultural resource sites for subsurface acres (based on the one site per 175 acre assumption presented in Chapter 3). However, these stipulations only apply to lands not leased or where a lease has come back to the federal government. Protection for cultural resources would rely on NHPA, Section 106 and Conditions of Approval. Based on the number of acres of restrictions, Alternative B offers more protection to cultural resources than Alternative A and has more potential to adversely affect cultural resources than Alternatives C and D.

Solid Minerals: Alternative B offers the same protection for cultural resources as Alternative A in the Fort Meade and Fossil Cycad ACECs, as they would be withdrawn from mineral entry and locatable mineral entry, and would be closed to both leasable and salable mineral entry. By keeping these areas off limits to mineral exploration and the potential surface disturbance from building roads, mineral extraction, and waste stockpiling, historic properties located in the ACECs would be protected. Historic properties would maintain their archaeological integrity and traditional users of these areas would be able to practice religious traditions without visual and audible disturbance from mining activities.

Due to the potential for damage and/or destruction of cultural and sacred sites from mining activities such as excavation, road construction, material stockpiling, and associated infrastructure construction, this alternative would have an indirect adverse effect on the visual landscape and a potential direct adverse effect on cultural and sacred sites. Visual and auditory disruptions would have an adverse effect on the TCPs identified in the northwest corner of the planning area, in the Black Hills, and at the Bear Butte National Historic Landmark. Potential adverse effects to cultural resources would be mitigated through inventory, avoidance or excavation through the NHPA, Section 106 process.

Lands and Realty

Land Tenure Adjustment: Alternative B offers maximum protection to cultural resources as it places all Special Designation Areas as Category 1 for retention, which means these lands would not be available for sale or exchange. Category 1 – Retention would include all ACECs and NRHP-eligible archeological sites/historic properties, and districts.

Land is identified for acquisition adjacent to and retention in the Fort Meade ACEC for benefit to cultural resources. The Fort Meade ACEC is identified for its high cultural values. Acquiring private land adjacent to this ACEC would contribute to the ACEC's value and potentially to the historic integrity of the sites within.

Two land transfers to other federal agencies are identified in Alternative B. These transfers would include transfer of up to 170 acres of BLM-administered land to the Department of Veterans Affairs and up to 50 acres to the South Dakota National Guard. This land is part of the Fort Meade ACEC. These transfers are considered an administrative action only; there would be no effects to cultural resources from the land exchange. The Department of Veterans Affairs and Department of Defense are under the same regulations for protection of historic properties (NHPA) as the BLM. Safeguards put in place prior to authorization of the transfer, such as Programmatic or Memorandum of Agreements among agencies, the SHPO, interested tribes, and the Advisory Council would ensure protection of historic properties from adverse effects.

Rights-of-Way and Avoidance Areas: Alternative B offers maximum protection to cultural resources, as it considers buried utility lines only where they can be safely buried. Burying utility lines would allow for a better cultural viewshed opportunity. Allowing alternatives for reroute avoidance or denying buried utility lines in important cultural resource areas would provide a minimal overall beneficial effect to cultural resources. The Fort Meade ACEC is also identified as a ROW exclusion area except for the Hooper Dairy Road and all other existing rights, confining utility and access to designated corridors only. This offers the most protection to cultural resources inside the ACEC. Alternative B also offers a greater number of surface restrictions than Alternative A, thus allowing more protection to cultural resources. This includes 189,153 acres open with avoidance restrictions. These restrictions would allow better protection to an assumed 1,081 cultural resource sites based on the one site per 175 acres presented in Chapter 3.

Withdrawal: Alternative B proposes withdrawal of federal locatable minerals for development (410 acres) beneath the Bear Butte National Historic Landmark, providing more protection to cultural resources than Alternative A and the same as Alternative D.

OHV Use and Travel Management Areas: Alternative B offers the least protection for cultural resources with more acres allowed for motorized travel off road. This increases the potential for adverse effects to cultural resources with inadvertent damage of cultural sites and illegal vandalism or looting of cultural sites. Alternative B designates 259,623 acres as limited to existing roads and trails. OHV use would be limited to designated roads and trails in ACECs and the Exemption Area SRMA (12,129 acres). Motorized travel would be allowed within 300 feet of roads for game retrieval and to access campsites. Game retrieval and off-road motorized camping access could lead to adverse effects to cultural resources. When vehicles are allowed to drive indiscriminately, archaeological features are vulnerable to damage and/or destruction.

Recreation: The designation of two new SRMAs (Fort Meade ACEC and the Exemption Area) would attract additional recreational activity and increase potential damage to any cultural resources that may occur within, or in close proximity to, these proposed SRMA areas. Consequently, indirect adverse effects would be greater under this alternative than Alternatives A and C, and the same as Alternative D. Adverse effects from these activities would be minimal, as they would be mitigated under standard NHPA, Section 106 procedures. Alternative B offers better opportunities for cultural resource public interpretation at cultural sites because designated SRMAs often enhance these opportunities.

Renewable Energy: Alternative B would offer greater protection to ACECs with these areas being closed to wind energy development. Public lands closed to commercial wind energy development within 1/2 mile of SRMAs would also allow

better protection of cultural resources in the Fort Meade ACEC, Fossil Cycad ACEC, and the Exemption Area. However, NRHP-eligible sites would still be open to wind energy development. These sites would rely on the mitigation protection of NHPA, Section 106. Alternative B proposes a significantly higher number of acres subject to restrictions such as closed areas, open with NSO or CSU stipulations, and timing restrictions. A total of 189,153 acres of avoidance restrictions are proposed under Alternative B. These acres would allow more protection of cultural resources (an assumed 1,081 cultural resource sites) than Alternative A and less protection than Alternatives C and D.

Special Designations: The same stipulations would apply to the Fort Meade and Fossil Cycad ACECs mentioned in Alternative A, with additional restrictions for ROW exclusion and closure of the ACECS to commercial renewable energy development. Additional acres are proposed to be incorporated into the NRHP site boundary (3,370 acres) to update its status to a National Landmark. These additional restrictions and status change would allow for more grant and cooperative agreement opportunities, allowing for the most protection of cultural resources in the ACECs.

Visual Resources: Effects would be similar to Alternative A, except most surface-disturbing activities would be prohibited and cultural viewsheds would be better protected with more VRM Class II and Class III acres. Alternative B would provide more protection to cultural sites due to greater restrictions on surface-disturbing activities allowable in these areas. A total of 1,517 acres of Class II would have the potential to protect an assumed nine cultural resource sites. An additional 5,168 acres of Class III lands would have the potential to protect an assumed 30 cultural resource sites. The remaining acreage still open to surface-disturbing activities would all be designated to Class IV lands (266,630 acres), in which adverse effects to cultural resource sites would be mitigated under NHPA, Section 106.

Impacts under Alternative C

Fire Management and Ecology: A total of 350 acres would receive mechanical fuels treatments, and 500 acres would be treated by prescribed fire annually over the life of the RMP. This would result in a potential effect to five cultural resource sites based on the one site per 175 acre assumption presented in Chapter 3. Adverse effects from these activities would be mitigated under standard NHPA, Section 106 procedures for all cultural resource sites. Prescribed fire and mechanical fuels treatments would be utilized to promote a healthy landscape and reduce wildfire potential. A healthy landscape would also help protect historic properties from wildfire and fire suppression activities.

Forest and Woodland Products: Alternative C would provide the most protection to cultural resources based on the least volume, estimated at 6,000 tons/year, and the most restrictions on new road construction and rerouting of existing roads. Maintenance of existing roads and temporary road construction would be allowed, although these actions would be kept to the minimum necessary to remove product. Adverse effects from these activities would be minimal as they would be mitigated under standard NHPA, Section 106 procedures.

Fluid Minerals: Under Alternative C, restrictions on oil and gas development would be moderately higher than Alternative A and much higher than Alternatives B and D. Potential adverse effects to cultural resources from oil and gas development would be less than Alternatives A, B, and D. Constraints proposed in this alternative would apply only to the lands not currently leased or those lands where a lease expires. Adverse effects to those areas already leased would be mitigated under standard avoidance or recovery procedures.

Under Alternative C, approximately 100,160 surface acres and 309,576 subsurface acres would be closed to fluid mineral leasing (includes 410 acres beneath the Bear Butte National Historic Landmark and 12,709 acres beneath the Black Hills Army Depot); 43,897 surface acres and 355,396 subsurface acres would be open subject to NSO stipulations; 1,535 surface acres and 1,535 subsurface acres would be subject to CSU stipulations. The restrictions would protect those BLM acres from oil and gas development surface-disturbing actions and have a beneficial effect on cultural resources and TCPs on BLM land. The closed and NSO stipulations would offer protection to an estimated 823 cultural resource sites for surface acres and 3,801 cultural resource sites for subsurface acres (based on the one site per 175 acre assumption presented in Chapter 3).

The Fort Meade, Fossil Cycad, and sage-grouse PPA ACECs would also be closed to leasing. All other areas proposed for leasing would be subject to standard stipulations with a Cultural Notice, which would still require mitigation such as an intensive inventory, avoidance or excavation under NHPA, Section 106. It is not anticipated that historic properties would be directly adversely affected because of mitigation through the NHPA, Section 106 process; however, there are concerns

that small block surveys do not provide a comprehensive understanding of cultural resources that may be present over a larger area. Concerns for effects to the cultural landscape are due to a standard of small block surveys only.

Solid Minerals: Alternative C would offer the most protection for cultural resources based on the highest number of acres (309,576) restricted from consideration for mineral leasing and closure for mining development in the Fort Meade, Fossil Cycad and Greater Sage-Grouse PPAs and ACECs and all federal minerals beneath the Bear Butte Historic Landmark site and the Black Hills Army Depot.

Throughout the rest of the planning area, due to potential for damage and/or destruction of cultural and sacred sites from mining activities such as excavation, road construction, material stockpiling, and associated infrastructure construction, this alternative would have an indirect adverse effect on the visual landscape and potentially a direct adverse effect on cultural and sacred sites. Visual and auditory disruptions would have an adverse effect on TCPs identified in the northwest corner of the planning area and in the Black Hills. Potential adverse effects to cultural resources would be mitigated through inventory, avoidance, or excavation through the NHPA, Section 106 process.

Lands and Realty

Land Tenure Adjustment: Land is identified for acquisition adjacent to and retention in the Fort Meade ACEC for benefit to cultural resources. The Fort Meade ACEC is identified for its high cultural values. Acquiring private land adjacent to this ACEC would contribute to the value of the ACEC and potentially to the historic integrity of the sites within.

Alternative C would also offer maximum protection to cultural resources as it places all Special Designation Areas as Category 1 for retention, and land is also identified for acquisition adjacent to and retention in the Fort Meade ACEC for benefit to cultural resources. The 150 acres of land identified for transfer in Alternatives B and D is not offered for consideration in Alternative C. Therefore, there would be no effect to cultural resources in Alternative C.

Rights-of-Way and Avoidance Areas: Alternative C would offer moderate protection to cultural resources as it considers burying all utility lines inside the Fort Meade ACEC. Burying utility lines would allow for a better cultural viewshed opportunity. Alternative C also considers Fort Meade ACEC the ROW exclusion area except for the Hooper Dairy Road and all other existing rights, confining utility and access to designated corridors only. This would offer the most protection to cultural resources inside the ACEC. Effects are likely minimal overall because potential adverse effects to cultural resources would be mitigated through inventory, avoidance, or excavation under the NHPA, Section 106 process. Alternative C also presents a higher number of restrictions than Alternatives A, B, and D, providing the most protection to cultural resources. A total of 199,420 acres are proposed for exclusion and 73,870 acres would remain open. The exclusion restrictions offer better protection to an assumed 1,140 cultural resource sites based on the one site per 175 acres presented in Chapter 3.

Withdrawal: Alternative C would provide the best protection to cultural resources with the most acres (100,160 surface and 296,592 subsurface) considered for withdrawal of federal locatable minerals from development. A mineral development withdrawal is considered in this alternative for the Fort Meade and Fossil Cycad ACECs along with 410 acres of federal mineral withdrawal proposed beneath the Bear Butte National Historic Landmark. Greater Sage-Grouse PPAs are considered for withdrawal; at 93,266 BLM-administered surface acres and 289,288 subsurface acres. This would potentially protect 572 cultural sites on surface lands and 1,695 cultural sites on subsurface (based on one cultural resource site per 175 acres).

OHV Use and Travel Management Areas: Alternative C would provide the greatest protection to cultural resources as it limits off-road motorized travel the most. Motorized travel is limited to designated roads and trails on 128,224 acres (47 percent of the planning area), including ACECs and Travel Management Areas (Fort Meade ACEC, Exemption Area, Center of the Nation). Motorized travel would only be allowed within 100 feet of roads to access campsites, and motorized travel off road for big game retrieval would not be allowed.

Recreation: Designation of one new SRMA (Fort Meade ACEC) would attract additional recreational activity and increase potential damage to any cultural resources that may occur within, or in close proximity to, the proposed SRMA area. Indirect effects to cultural resources would be less than Alternatives B and D. Adverse effects from these activities would be minimal as they would be mitigated under standard NHPA, Section 106 procedures.

Renewable Energy: In Alternative C, impacts would be less than Alternatives A, B, and D; therefore, Alternative C would offer greater protection to cultural resources with more restricted areas. Restricted acres include exclusion areas (a total of 199,420 acres), protecting an assumed 1,140 cultural resource sites, (based on the one site per 175 acre assumption in Chapter 3). The Greater Sage-Grouse PPAs would be closed to renewable energy development and commercial wind energy projects would be restricted to a one-mile radius of SRMAs. These constraints along with the restrictions would prohibit any surface disturbance in these areas, resulting in a beneficial effect to cultural resources.

Special Designations: The same stipulations would apply to the Fort Meade and Fossil Cycad ACECs as mentioned in Alternative B with the exception that forest and woodland product treatments would be allowed in the Fossil Cycad ACEC unless restricted. Additional acres are proposed to be incorporated into the NRHP site boundary (3,370 acres). Fewer proposed restrictions and no change in status would allow for better protection than Alternative A and less than Alternative B. In addition, Alternative C would propose Greater Sage-Grouse PPAs as an ACEC. Compared to Alternatives B and D, an ACEC designation of PPAs within Alternative C would not result in any noticeable or measurable benefits to cultural resources since this area would have other protective measures through other actions which limit surface disturbance (and thus protect cultural resources).

Visual Resources: Alternative C would offer the most protection to cultural resources because more acres of Class II and Class III (192,603 acres) would have the potential to protect an assumed 1,100 cultural resource sites because it would prohibit most surface-disturbing activities and increase protection of the cultural viewshed. This would provide greater protection to cultural sites because there would be more restrictions on surface-disturbing activities in these areas. The remaining acreage still open to surface-disturbing activities would be Class IV lands (80,712 acres) that would still offer protection of the cultural viewshed; however, adverse effects to cultural resource sites would be mitigated under NHPA, Section 106.

Impacts under Alternative D (Preferred Alternative)

Fire Management and Ecology: A total of 400 acres would receive mechanical fuels treatments, and 1,000 acres would be treated by prescribed fire annually over the life of the plan. This would result in a potential effect to eight cultural resource sites based on the one site per 175 acre assumption presented in Chapter 3. Adverse effects from these activities would be mitigated under standard NHPA, Section 106 procedures for all cultural resource sites. Prescribed fire and mechanical fuels treatments would be utilized to promote a healthy landscape and reduce wildfire potential. A healthy landscape would also help protect historic properties from wildfire and fire suppression activities.

Forest and Woodland Products: Alternative D estimates the PSQ would be approximately 7,000 tons/year for all forest and woodland products, the same as Alternatives A and B. As in Alternative B, Alternative D has the most potential to damage cultural resources because new roads would be constructed for long-term management of areas where multiple entries are anticipated and rerouting and maintenance are specifically authorized. New roads built to access forest products may cause direct adverse effects to cultural resources and indirect adverse effects by allowing access opportunities that could encourage looting and vandalism. Adverse effects from these activities would be moderate because they would be mitigated under standard NHPA, Section 106 procedures.

Fluid Minerals: Under Alternative D, more restrictions would be placed on oil and gas development than Alternative A, less than Alternative C, and similar to Alternative B, offering moderate protection to cultural resources. Restrictions include 6,894 surface acres and 7,304 subsurface acres closed (includes 410 acres beneath the Bear Butte National Historic Landmark); 107,025 surface acres and 406,005 subsurface acres open with NSO; and 10,031 surface acres and 146,574 subsurface acres subject to CSU stipulations. The closed and NSO stipulations would offer protection to an estimated 651 cultural resource sites for surface acres and 2,363 cultural resource sites for subsurface acres (based on the one site per 175 acre assumption presented in Chapter 3).

Lands and Realty

Land Tenure Adjustment: Impacts for acquisition and retention would be the same as under Alternatives B and C.

Two land transfers to other federal agencies are identified in Alternatives B and D. These transfers would include the transfer of up to 170 acres of BLM-administered land to the Department of Veterans Affairs and up to 50 acres to the South Dakota National Guard. This land is part of the Fort Meade ACEC. These transfers are considered an administrative action only and the land exchange would have no effects to cultural resources. The Department of Veterans Affairs and Department of Defense are under the same regulations for protection of historic properties as the BLM. Safeguards put in place prior to authorization of the transfer, such as Programmatic or Memorandum of Agreements among agencies, the SHPO, interested tribes, and the Advisory Council would ensure protection of historic properties from adverse effects.

Rights-of-Way and Avoidance Areas: Alternative D offers similar restrictions to Alternative B, with 5,836 acres excluded and 191,704 acres subject to avoidance restrictions. An estimate of 1,129 sites would fall inside these restricted areas based on the assumption of one site per 175 acres presented in Chapter 3. Alternative D offers similar protection to cultural resources as Alternative C, and greater protection than Alternatives A and B.

Withdrawal: Withdrawal of 410 acres of federal locatable minerals beneath the Bear Butte National Landmark would afford similar protection to cultural resources as Alternative C.

OHV Use and Travel Management Areas: Alternative D, like Alternative B, offers the least protection for cultural resources with more acres allowed for motorized travel off road, increasing the potential for more effects to cultural resources from inadvertent damage to cultural sites and illegal vandalism or looting. Impacts would be the same as Alternatives A and C for game retrieval and the same as Alternative C for campsite access.

Recreation: The designation of two new SRMAs (Fort Meade ACEC and the Exemption Area) would attract additional recreational activity and increase potential damage to any cultural resources that may occur within, or in close proximity to, these proposed SRMA areas. Consequently, indirect adverse effects would be greater under this alternative than Alternatives A and C, and the same as Alternative B. Adverse effects from these activities would be minimal, as they would be mitigated under standard NHPA, Section 106 procedures. As in Alternative B, Alternative D offers better opportunities for cultural resource public interpretation at cultural sites because designated SRMAs often enhance these opportunities.

Renewable Energy: Impacts would be similar to Alternative C; however, more surface restrictions are proposed than Alternatives A and B and less than Alternative C, offering moderate protection to cultural resources. A total of 118,904 acres are excluded and 78,636 acres of avoidance restrictions are proposed under alternative D. These acres would allow more protection to an assumed 1,129 cultural resource sites based on the 1 site per 175 acres assumption presented in chapter 3.

Solid Minerals: Like Alternative C, Alternative D would offer the most protection for cultural resources based on the highest number of acres (7,294) restricted from consideration for mineral leasing and closure for mining development in the Fort Meade and Fossil Cycad ACECs and all federal minerals beneath the Bear Butte Historic Landmark site.

Throughout the rest of the planning area, due to potential for damage and/or destruction of cultural and sacred sites from mining activities such as excavation, road construction, material stockpiling, and associated infrastructure construction, this alternative would have an indirect adverse effect on the visual landscape and potentially a direct adverse effect on cultural and sacred sites. Visual and auditory disruptions would have an adverse effect on TCPs identified in the northwest corner of the planning area and in the Black Hills. Potential adverse effects to cultural resources would be mitigated through inventory, avoidance, or excavation through the NHPA, Section 106 process.

Special Designations: The same stipulations would apply to the Fort Meade and Fossil Cycad ACECs mentioned in Alternative A with additional restrictions for ROW exclusion and closure of the ACECS to commercial renewable energy development. Additional acres are proposed to be incorporated into the NRHP site boundary (3,370 acres) to update its status to a National Landmark. These additional restrictions and status change would allow for more grant and cooperative agreement opportunities, allowing for the most protection of cultural resources in the ACECs.

Visual Resources: Alternative D offers 11,763 acres of Class II and III that would have the potential to protect 67 cultural resource sites. The remaining 261,552 acres of Class IV would still offer some protection of the cultural viewshed; however, adverse effects to cultural resource sites would be mitigated under NHPA, Section 106. Since large amounts of

acreage in Classes II and III would prohibit most surface-disturbing activities and increase protection, effects to cultural resources would be less than Alternatives A and B, more than Alternative C.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

The cumulative impact analysis boundary for cultural resources includes the entire SDFO planning area. The SDFO planning area is comprised of a mixture of federal, tribal, state, and private lands, extending across 37 counties throughout the state of South Dakota. Within the planning area, the BLM administers about 274,000 acres of BLM public land surface as shown on Map 1-1 in Chapter 1, and approximately 1.7 million acres of federal mineral estate in the 37 counties. The following discussion indicates the environmental impact on cultural resources from implementing each of the proposed Alternatives (A, B, C and D) when considering past, present and reasonably foreseeable future actions that make up the cumulative impact scenario.

Decisions from this RMP would have impacts which, when combined with other past, present, and reasonably foreseeable actions, would produce cumulative impacts on cultural resources and religious, traditional or other Native American areas of significance. The potential for cumulative impacts includes neighboring lands with connected cultural resources and actions including adjoining BLM Field Offices, state and private lands within and outside the planning area, and adjacent National Forest lands. Every impact to cultural resources is cumulative; adverse impacts are permanent, and beneficial impacts cannot reverse these impacts.

Increasing development pressure including increased oil and gas and renewable energy development; recreation uses; construction of pipelines, transmission lines, and roads; urban expansion within the planning area, especially in the Black Hills and Rapid City vicinity; and livestock grazing would likely continue on a regional scale. Resource management activities within the planning area and surrounding areas would likely result in a trend toward increased adverse impacts and ultimately the destruction of many cultural resources through time and across political boundaries. If this trend continues as expected, the preservation of cultural resources, research, public education, and consultation with Native American Tribes will become even more critical.

Surface-disturbing activities are the greatest contributor to cumulative impacts to cultural resources. Residential development and associated recreation opportunities and access on adjacent public lands, both within and in close proximity to the SDFO planning area, will continue to be a likely action for adverse effects on cultural resources. Other past and present actions that have affected and would continue to adversely affect cultural resources include energy and mineral exploration and development; range improvements; lands and realty ROWs; OHV travel and recreation use; wildland fires, and vegetation treatments for fire management and forest health. These actions have cumulative impacts on cultural resources through surface disturbance that contributes to erosion and subsequent sedimentation; exposure of contributing cultural features and artifacts from removal of vegetative cover; and better vehicular access to historic properties that could lead to relic hunting, and/or disturbance to contributing features and artifacts by vandals.

Federal undertakings currently require adherence to cultural resource laws and regulations requiring inventory; identification and evaluation of cultural sites; avoidance; and in some cases data recovery. These requirements are expected to continue into the future. While federal undertakings can and do extend some protection for cultural resources onto private lands exclusive private projects are only subject to state statutes covering cases of inadvertent discovery of burials.

Under all alternatives, beneficial impacts such as those from road closures, reduced livestock grazing, and protections afforded water resources and wildlife, and the maintenance of large undisturbed land blocks may help to offset these impacts. All undertakings would be subject to the Section 106 process of the NHPA and other applicable laws and regulations. Adherence to appropriate pre-development, development, and post-development protective measures are critical to mitigate direct, indirect, and cumulative impacts.

Cumulative Impacts under Alternative A (Current Management)

Alternative A would provide the least amount of protection for cultural resources on BLM-administered lands and would result in the greatest cumulative impacts when compared to the other alternatives. Cumulative adverse impacts to cultural resources are anticipated to be moderate based on site evaluation, avoidance, and data recovery mitigation as outlined in the NHPA, Section 106 compliance.

Cumulative Impacts under Alternative B

Under Alternative B, surface-disturbing activities on BLM-administered public lands would only slightly diminish impacts and effects to cultural resources and only slightly improve cultural resource protection values over Alternative A. Alternative B would provide better protection for cultural resources on BLM-administered lands and would result in fewer cumulative impacts when compared to Alternative A. Cumulative adverse impacts to cultural resources are anticipated to be moderate based on site evaluation, avoidance, and data recovery mitigation as outlined in NHPA, Section 106 compliance.

Cumulative Impacts under Alternative C

Under Alternative C, the level of surface-disturbing activities on BLM-administered public lands would greatly reduce impacts and effects to cultural resources and improve protection of cultural resource values over the other alternatives. Alternative C would provide the best protection for cultural resources on BLM-administered lands and would result in the least cumulative impacts when compared to the other alternatives. Cumulative adverse impacts to cultural resources are anticipated to be minor based on site evaluation, avoidance, and data recovery mitigation as outlined in the NHPA, Section 106 compliance.

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D is similar to Alternative B with greater amounts of surface-disturbing activities on BLM-administered public lands than Alternative C and less than Alternative A. Alternative D would only slightly diminish impacts and effects to cultural resources and only slightly improve protection of cultural resource values compared to Alternative A.

Alternative D would provide better protection for cultural resources on BLM-administered lands and would result in fewer cumulative impacts when compared to Alternatives A and B and less than Alternative C. Cumulative adverse impacts to cultural resources are anticipated to be minor to moderate based on site evaluation, avoidance, and data recovery mitigation, as outlined in the NHPA, Section 106.

Paleontological Resources

Direct impacts to paleontological resources from alternatives typically result from actions that physically alter, damage, or destroy fossils or their contexts. For example, any type of surface disturbance in an area containing fossil resources could have a direct impact by disturbing important paleontological values. These actions may also have an indirect impact by providing greater access to the area, which can bring increased vandalism, looting, and inadvertent damage that could impact fossils or their contexts. Conversely, actions that result in data collection and preservation or establishment of paleontological resources can be considered beneficial impacts.

Assumptions

The impact analysis is based on the following assumptions:

Significant vertebrate and invertebrate fossils would continue to be found throughout the upper Jurassic Morrison formation and the overlying lower Cretaceous Lakota sandstone; the late Cretaceous Hell Creek formation and the overlying Ludlow formation; and in the Slim Buttes formation and the various formations combined into the White River Group and the Arikaree Group, spanning the Eocene to Miocene Epochs, exposed in the planning area.

The number of paleontological resources that could be impacted by various actions is directly correlated with the degree, nature, and quantity of surface-disturbing activities within the planning area.

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 on 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.

In accordance with BLM IM 2008-009 and IM 2009-011, paleontological assessments would be completed for all projects proposed on federal lands. These assessments would determine the need for further paleontological inventories. Inventories would evaluate the effects of the project on paleontological resources and would recommend appropriate mitigation measures to protect the resource.

Mitigation efforts applied to surface disturbance in areas known or suspected to contain significant paleontological resources would result in identification and evaluation of previously undiscovered resources. In addition, continuing scientific research within the planning area would identify new paleontological resources. The BLM would then manage these newly discovered resources accordingly.

Impacts Common to All Alternatives

The types of effects projected to occur to paleontological resources from implementation of the alternatives are similar; however, the intensity of effects would vary across the proposed alternatives. Paleontological assessments completed prior to surface disturbance would mitigate a large percentage of potential adverse effects. It is anticipated that damage created by inadvertent discovery would be the most prominent adverse effect. Under the Potential Fossil Yield Classification (PFYC) system, geologic units are classified based on the relative abundance of vertebrate fossils or uncommon invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential. The classification system is intended to provide baseline guidance to assessing and mitigating impacts to paleontological resources.

A total of 45,870 (Class 4 and 5) acres in the planning area are considered to have a high probability for paleontological resources. Another 221,285 acres (Class 3) are areas where fossil content varies in significance, abundance, and predictable occurrence or contain sedimentary units of unknown fossil potential.

Fire Management and Ecology: Damage to paleontological resources could occur as a direct result of surface disturbances caused by wildfire suppression activities (construction of fire lines, bulldozing access roads, and general movement of heavy equipment) and indirect instances of increased erosion, although fire itself has nearly no effect. Because of the unplanned nature of wildfires, impacts on paleontological resources from wildfire suppression activities would generally be unmitigated due to the emergency nature of wildfire. Ground-disturbing activities during firefighting actions and post-fire rehabilitation activities could damage or destroy known and unknown significant paleontological resources. With increased accessibility (fire breaks, roads) the potential for vandalism and looting increases.

Fire management actions that minimize the potential for unplanned wildfires or that lessen suppression activities would indirectly protect paleontological resources. Increased erosion from loss of vegetation following wildfires could accelerate exposure and deterioration of paleontological resources. Identification of known localities and sensitive areas during fire planning efforts would allow for possible avoidance or modification of fire suppression activities, such as reducing the use of heavy equipment in sensitive areas.

Fish, Wildlife, and Special Status Species: Physical damage and/or destruction of paleontological resources could result from habitat improvement projects that require surface disturbance and user access. However, anticipated effects would be minimal, if at all, based on avoidance and mitigation actions.

Forest and Woodland Products: Physical damage and/or destruction of paleontological resources could result from vegetation improvement and forest product harvest projects that require surface disturbance and increased user access. Based on current vegetation distribution in the planning area, effects of forestry driven projects would be negligible. Paleontological resources could be affected by projects proposed in the Exemption Area of the Black Hills; however,

anticipated effects would be minimal, if at all, based on a low to moderate potential for paleontological resources, avoidance, and mitigation actions.

Fluid Minerals: Fluid minerals development has a greater potential to affect paleontological resources than other resource uses from related surface-disturbing activities. Fluid mineral development increases access to and disturbance of locations that previously may not have had much public use. Development of roads and well pad construction (both surface disturbances) have the potential to directly damage or destroy paleontological resources and indirectly (via access and increased use) increase vandalism and looting.

Approximately 45,870 (Class 4 and 5) subsurface acres (3 percent) within the planning area are considered to have a high potential for paleontological resources, and another 221,285 (Class 3) acres (13 percent) are considered to have a moderate potential for paleontological resources. Of this acreage, Class 3 and 5 overlap 100 percent of the area considered to have high potential for oil and gas development (84,817 acres); and Class 3, 4, and 5 overlap 100 percent of the area considered to have moderate probability for oil and gas development (65,565 acres).

Buffalo Field Development Area: The Buffalo field is considered to have a high potential for oil and gas development. It is located in the northwest corner of the planning area and has expanded to be the largest field in the state with over 84,820 acres, almost two and 1/2 times as large as the next largest field, Cady Creek. Of these acres, 15,411 acres (18 percent) of BLM-administered federal minerals are located in high probability geologic units (PFYC Class 5). Another 2,042 acres (2.4 percent) are located in the moderate probability geologic unit (PFYC Class 3). No PFYC Classes 1, 2, or 4 are presently identified inside the Buffalo field. The combined total acres for PFYC Class 3 (moderate probability) and Class 5 (high probability) is 17,453 acres or (20.5 percent) of the Buffalo field area. Leasing and development of federal minerals in the Buffalo field would have moderate to little effect on significant paleontological resources on BLM-administered land. Project proposals in areas with high potential geologic units would be subject to a paleontological assessment and a determination would be made at that time to determine whether a paleontological inventory would be required. Based on the outcome of any required paleontological inventory, mitigation measures would be implemented, as necessary, to protect significant paleontological resources.

West Short Pine and Cady Creek Field Development Areas: West Short Pine Hills and Cady Creek fields are located southwest of Buffalo field in the northwest portion of the planning area. These are the only producing gas fields in this area and contain a moderate potential for oil and gas development with a total combined land area of 67,565 acres. Of these acres, 16,091 acres (24 percent) are located within high probability geologic units (PFYC Classes 4 and 5) on BLM-administered federal minerals. Another 5,495 acres (8 percent) of BLM-administered minerals are located in the moderate probability geologic unit (PFYC Class 3). No PFYC Classes 1 or 2 are presently identified inside the West Short Pines and Cady Creek fields. The combined total acres for the PFYC Classes 4 and 5 (high probability) and PFYC Class 3 (moderate probability) is 21,586 acres or (32 percent) of the West Short Pine Hills and Cady Creek fields. Oil and gas leasing and development on federal-administered minerals located in the West Short Pine Hills and Cady Creek areas, would have potential for moderate effects on significant paleontological resources located on BLM-administered land. Project proposals in areas with high potential geologic units would be subject to a paleontological assessment, and a determination would be made at that time whether a paleontological inventory would be required. Based on the outcome of any required paleontological inventory, mitigation measures would be implemented, as necessary, to protect significant paleontological resources.

Lands and Realty: Lands and Realty management actions could impact paleontological resources by transferring or disposing of BLM land, thereby removing federal protection measures and land use stipulations. However, prior to transfer or disposal of BLM land, a paleontological assessment providing for adequate data recovery and documentation of significant paleontological resources would be required. In addition, if surveys identified significant paleontological resources, the realty action could be adjusted to retain associated parcels containing the resources. Given these conditions, potential effects would be minimal. Administrative actions that restrict scientific research, through restriction of either surface disturbance or access, would limit recovery of paleontological resources.

Increased access in areas of high probability for paleontological resource occurrence would enhance research opportunities for authorized paleontologists by allowing them to travel to areas otherwise inaccessible. Conversely, improved access would also increase the likelihood of unauthorized collection of paleontological resources. Ease of access by the public has a direct link to instances of looting or vandalism of fossil resources. The degree of public access to paleontological sensitive areas often determines the extent of the effect.

The issuance of ROWs, leases, and permits has the potential to affect paleontological resources because they allow for specific access or activities to occur on BLM land. The effects of access are addressed above and the effects of surface-disturbing activities are addressed throughout. Withdrawal of land from a given use can have a beneficial effect on paleontological resources because surface-disturbing activities associated with the withdrawn resource use would no longer have an effect.

Livestock Grazing: Direct adverse effects to paleontological resources could result from trampling and/or trailing by livestock. Indirect adverse effects could result from increased levels of erosion that occur from livestock trampling and/or trailing. Normally livestock trampling and trailing is limited to areas directly adjacent to livestock water sources, gates, and salt and mineral supplements.

OHV Use and Travel Management Areas: Unauthorized roads and trails have the potential to decrease vegetative cover and increase erosion, leading to potential exposure, damage, or destruction of paleontological resources. Unauthorized trails that are created in badlands areas, particularly in areas with steep slopes, increase potential effects since fossil materials are often exposed in these areas. Unauthorized routes can lead to easier access to sensitive areas, increasing the potential for looting and/or vandalism. The significance of these effects would depend on the location of travel and/or OHV use in relation to the occurrence of paleontological resources.

Recreation: Dispersed recreational activities in the planning area are not subject to paleontological clearances but could affect paleontological resources through inadvertent discovery, removal, damage, and/or destruction of paleontological resources. Although recreational collecting of common invertebrate fossils and plants is permissible, the uninformed or willful collection of significant, and therefore protected, paleontological resources could result in damage to or complete removal of significant fossil resources from BLM land.

Management actions for SRMAs that encourage recreation and development of facilities would impact paleontological resources directly through ground-disturbing activities. Indirect impacts would result from the increase in human activity, which would increase potential for vandalism. Direct impacts from ground-disturbing actions would be mitigated by resource assessments, avoidance restrictions, and data recovery procedures.

Renewable Energy: Renewable energy has the potential to affect paleontological resources because of the high degree of surface disturbance required during construction. If roads and infrastructure are not managed appropriately, continued maintenance activities may also have effects on paleontological resources. Based on high potential wind development location, paleontological resources could be impacted by projects proposed in the northwest quarter of the state, in the Badlands area of south central South Dakota, and in the Exemption Area of the Black Hills. However, anticipated effects would be minimized or eliminated through avoidance and mitigation actions.

Soil Resources: Soil management activities that reduce soil loss would serve to maintain the soil and vegetation cover, thereby reducing or preventing degradation of paleontological resources within the bedrock. Restrictions on development projects and implementation of intensive management activities to reduce erosion, whether naturally occurring or related to development activity, would reduce exposure and degradation of paleontological resources. Projects that reduce or prevent soil erosion would have a beneficial effect on paleontological resources. Maintaining soil and vegetation cover would increase protection of paleontological resources because of the decreased levels of erosion associated with higher plant cover. Increased vegetative cover can also reduce visibility of paleontological resources and lower the potential for inadvertent discovery if public use increases.

Solid Minerals: Solid mineral leasing has the potential to affect paleontological resources because of the high degree of surface disturbance required to remove minerals from the ground. Based on the location of existing mining claims, leasable mineral claims would have virtually no effect on paleontological resources. All but a very small percentage of claims are located in low to moderate probability areas.

Special Designations: Disturbance of paleontological resources within SMAs and the ACECs would be minimal because of increased restrictions on development, surface occupancy, and surface-disturbing activities. Effects from permitted surface-disturbing activities are anticipated to be minimal because all activities would require assessment for paleontological resources and appropriate mitigation would be provided. One of the proposed special designation areas, the Fossil Cycad ACEC, contains a high probability paleontological area.

Surface-Disturbing Activities: BLM paleontological resource management policy requires assessment of paleontological resources prior to surface-disturbing activities. Any required surveys or mitigation actions would be performed by a BLM-permitted paleontologist. This would serve to protect most paleontological resources from damage. Beneficial effects from identification, recordation, and collection of paleontological resources would occur as a result of paleontological surveys and mitigation activities.

Unmitigated surface-disturbing activities could damage or destroy paleontological resources that were unknown prior to that activity. Surveys performed prior to surface disturbance would not always locate all fossil material; therefore, surface disturbances in surveyed areas may still damage undiscovered paleontological resources. Where the likelihood for fossil discovery is high, a BLM-permitted paleontologist may be required to monitor any proposed surface-disturbing activity. Subsurface paleontological resources cannot be identified prior to their disturbance, but some geological features can indicate a higher likelihood of subsurface paleontological resource occurrence. Surface disturbances could expose fossils to discovery, thereby enhancing scientific knowledge, which would otherwise have been buried until they were exposed by natural erosion.

Damage or destruction of unidentified paleontological resources is possible during any surface-disturbing activity. Impacts to unknown paleontological resources would often be greater than impacts on resources that had been previously identified. These impacts would complicate mitigation procedures and result in a loss of scientific information. If paleontological resources that are discovered during disturbance activities remain salvageable, further impacts could be mitigated through recovery of the fossil material and related data. Most surface-disturbing activities, including those that have mitigation measures applied, would preclude any future research.

Surface-disturbing activities are a component of several resource management and development actions. The aforementioned inventory assessment and mitigation procedures would be applied in a similar manner to all surface-disturbing activities, but could vary in the level of mitigation on a case-by-case basis, depending primarily on the potential for effect to significant paleontological resources and the degree of planned disturbance. These procedures would not change under the various alternatives.

Vegetative Communities: Physical damage and/or destruction of paleontological resources could result from vegetation improvements that require surface disturbance and user access. However anticipated effects would be minimal, if at all, based on avoidance and mitigation actions.

Impacts under Alternative A (Current Management)

Fluid Minerals: This alternative has the most acreage available for lease. With a total of 19,613 subsurface mineral acres (2,954 surface acres) available for lease under CSU stipulations and 87,349 subsurface mineral acres (15,489 surface acres) available for lease with NSO, Alternative A has the least acreage available with restrictions. A total of 6,894 mineral acres (6,894 surface acres) would be closed to leasing in the Fossil Cycad and Fort Meade ACECs. Alternative A has fewer acres closed than Alternatives C and D and more than Alternative B.

Surface-disturbing activities associated with leasable mineral sales and energy exploration and development could result in mitigated impacts to paleontological resources. In addition, the potential for indirect and inadvertent impacts would increase proportionally to the amount of land available for mineral leasing and development. Of all the alternatives, Alternative A would have the greatest adverse effect on paleontological resources. Fewer acres have surface limitations, which have the potential to increase adverse effects to paleontological resources. With high oil and gas development, roads would be created when necessary and increase the potential for inadvertent discovery, looting, and vandalism.

Forest and Woodland Products: Forest product removal by sale is prohibited in the Fossil Cycad ACEC providing better protection of paleontological resources in the ACEC than Alternative C and the same as Alternatives B and D.

Lands and Realty

Land Tenure Adjustment: Lands identified for retention and acquisition within ACECs would have a beneficial effect for paleontological resources because these lands would continue to receive higher levels of protection. Lands in the Fossil Cycad ACEC are not identified for retention under Alternative A. ROW restrictions are lowest in Alternative A, with

only 5,522 acres excluded and 267,768 acres open. Based on these restrictions, Alternative A offers the least protection to paleontological resources.

OHV Use and Travel Management Areas: Alternative A continues current travel management designations for a majority of acres limited to existing roads and trails (264,706 acres) and an additional (7,046 acres) limited to designated roads and trails in ACECs. Additionally, motorized travel would be allowed within 300 feet of roads to access campsites, although no cross-country motorized travel for big game retrieval would be allowed. Alternative A has the greatest potential to impact paleontological resources since it provides no restrictions for non-motorized recreation, and none are specified for the Fossil Cycad ACEC.

Under Alternative A, no game retrieval would be allowed, which would have a beneficial effect on paleontological resources. No game retrieval would limit the type, number, and degree of cross-country travel, thus decreasing the number of inadvertent discoveries that could lead to damage, destruction, and/or theft of paleontological resources.

Renewable Energy: Under Alternative A, renewable energy development has the most potential to affect paleontological resources because of the amount of surface disturbance required during construction. Alternative A has very few acres of restrictions, with only 5,522 acres excluded. All remaining areas in the planning area (267,795 acres) are open to wind and other renewable energy development, including the Fossil Cycad ACEC, Class 3, 4, and 5 high potential fossil yield areas. The addition of either wind turbines or transmission lines in these areas could have adverse effects to paleontological resources.

Solid Minerals: Solid mineral leasing has the potential to affect paleontological resources, because of the high degree of surface disturbance required to remove the minerals from the ground. Based on the location of existing mining claims, leasable mineral claims would have limited to no effect upon paleontological resources. In Alternative A, the Fossil Cycad ACEC would not be closed or withdrawn from further consideration for leasing, allowing the least protection to paleontological resources.

Visual Resources: Alternative A would provide the least protection to paleontological resources because no acreage would be assigned to VRM Class I. Paleontological resources located in Class II (1,204 acres) and Class III (4,876 acres) areas would have greater protection than those located in Class IV (530 acres) and the remaining (266,706 acres) undesignated areas.

Impacts under Alternative B

Fluid Minerals: This alternative has the second most acreage available for lease and a moderate potential for adverse effects to paleontological resources. With a total of 158,501 subsurface mineral acres (10,561 surface acres) available for lease under CSU stipulations and 404,306 subsurface mineral acres (105,837 surface acres) available for lease with NSO, Alternative B has more acres of surface restrictions than Alternative A, and less than Alternatives C and D. A total of 6,574 subsurface mineral acres (6,574 surface acres) would be closed to leasing in the Fort Meade ACEC. Alternative B has the least number of acres under this restriction. The Fossil Cycad ACEC, which has significant paleontological resources, is available for lease with NSO in Alternative B, causing the most potential for adverse effects.

Surface-disturbing activities associated with leasable mineral sales, energy exploration, and development could result in mitigated impacts to paleontological resources. In addition, the potential for indirect and inadvertent impacts would increase proportionally to the amount of land available for mineral leasing and development. Of all the alternatives, Alternative B would have a greater adverse effect than Alternative C, less effect than Alternatives A and D on paleontological resources. Fewer acres have surface limitations to limit adverse effects compared to Alternatives C and D. With increased oil and gas development, more roads would be created thus increasing potential for inadvertent discovery, looting, and vandalism.

Forest and Woodland Products: Alternative B has the most potential to damage paleontological resources because new roads would be constructed for long-term management of areas where multiple entries are anticipated. New roads built to access forest products may cause direct effects to resources and indirect effects from increased access for illegal looting and vandalism. As in Alternative A, forest product removal by sale is prohibited in the Fossil Cycad ACEC, providing better protection of paleontological resources in the ACEC than Alternative C.

Lands and Realty: Alternative B offers better protection to paleontological resources than Alternative A, as it places all Special Designation Areas as Category 1 for retention, which means these lands would not be available for sale or exchange. Category 1 – Retention would include all ACECs and NRHP-eligible archeological sites/historic districts. Retention of the Fossil Cycad ACEC would benefit paleontological resources.

Additionally, all Greater Sage-Grouse PPAs are in ROW restriction areas where many PPAs overlap high probability areas for paleontological resources (Classes 4 and 5). When possible, power and utility lines would be buried. Impacts from trenching or digging would be minimal based on inventory of projects in the Class 4 and 5 potential areas and avoidance by properly locating routes around paleontological sites.

ROW restrictions are greater than Alternative A and less than Alternatives C and D. No acres (less than Alternatives A, C, and D) are excluded; and 189,153 acres are open subject to avoidance restrictions. Based on these restrictions, Alternative B offers more protection than Alternative A, and less than Alternatives C and D.

OHV Use and Travel Management Areas: Alternative B offers better protection than Alternative A, with a 320-acre restriction to non-motorized traffic in the Fossil Cycad ACEC. However, in the rest of the planning area, more acres are allowed for motorized travel off road, increasing the potential for greater effects with inadvertent damage of unknown sites and illegal vandalism or looting. Motorized travel would be allowed within 300 feet of roads to access campsites, and motorized game retrieval would be allowed up to 300 feet from existing roads. Alternative B also designates 259,623 acres limited to existing roads and trails and 12,129 acres limited to designated roads and trails in ACECs and the SRMA Exemption Area.

Renewable Energy: Under Alternative B, renewable energy development has less potential to affect paleontological resources than Alternative A (based on more avoidance restrictions), and more than Alternatives C and D. A total of 189,153 acres of avoidance restrictions are proposed leaving 84,137 acres open. The second least acreage of restrictions are planned for Alternative B, limiting protection of paleontological resources. Alternative B offers more protection to ACECs, including the Fossil Cycad ACEC, because no renewable energy development authorizations are allowed.

Solid Minerals: Solid mineral leasing has the potential to affect paleontological resources due to the high degree of surface disturbance required to remove minerals from the ground. Based on the location of existing mining claims, leasable mineral claims would have limited to no effect on paleontological resources. In Alternative B, the Fossil Cycad ACEC would be closed or withdrawn from further consideration for leasing allowing the most protection to paleontological resources.

Visual Resources: Effects would be similar to Alternative A, except most surface-disturbing activities would be prohibited and paleontological resources would be better protected with 1,517 acres of Class II and 5,168 acres of Class III lands. This would provide more protection to resources due to more restrictions on surface-disturbing activities allowable in these areas. The remaining acreage still open to surface-disturbing activities would all be designated to Class IV lands (266,630 acres) where adverse effects would be mitigated through inventory and monitoring. Alternative B proposes the Fossil Cycad ACEC be designated Class II, offering paleontological resources more protection than Alternative A.

Impacts under Alternative C

Fluid Minerals: Alternative C would have a total of 1,535 subsurface mineral acres (1,535 surface acres) available for lease under CSU stipulations, and 355,396 subsurface mineral acres (43,897 surface acres) available for lease with NSO. Alternative C has more acres of surface and subsurface restrictions than Alternatives A, B, and D. A total of 309,576 subsurface mineral acres (100,160 surface acres) would be closed to leasing in the Bear Butte National Historic Landmark, Black Hills Army Depot, Fossil Cycad ACEC, Fort Meade ACEC, and Greater Sage-Grouse PPAs. Alternative C has more acres under this restriction than Alternatives A, B, and D.

Surface-disturbing activities associated with leasable mineral sales and energy exploration and development could result in mitigated impacts to paleontological resources. In addition, the potential for indirect and inadvertent impacts would increase proportionally to the amount of land available for mineral leasing and development. Of all the alternatives, Alternative C has the most acres of restrictions having a minor effect on paleontological resources. These surface limitations have the potential to decrease adverse effects to paleontological resources. With moderate oil and gas

development, roads would be created when necessary and increase the potential for inadvertent discovery. Alternative C would not, however, have as many adverse effects as Alternatives A, B, and D.

Forest and Woodland Products: Alternative C has the least potential to damage paleontological resources in the planning area, because new roads would not be constructed for forest product removal, and method of treatments would favor natural processes that are likely less ground disturbing. Although the least volume (estimated at 6,000 tons/year) is proposed in Alternative C, forest product removal is not prohibited in the Fossil Cycad ACEC, providing no protection of paleontological resources in the ACEC.

Lands and Realty: Alternative C offers less protection to paleontological resources than Alternative B, as it requires that all power and utility lines would be buried which could have more effects on paleontological resources based on amount of ground disturbance. However, effects are likely minimal based on inventory of management projects in the Class 3, 4 and 5 potential fossil yield areas and avoidance by design.

Alternative C is similar to Alternatives B and D, as it offers better protection to paleontological resources than Alternative A, with all Special Designation Areas placed in Category 1 - Retention, which means these lands would not be available for sale or exchange. Category 1 – Retention would include all ACECs and NRHP-eligible archeological sites/historic districts. Direct benefit to paleontological resources is the retention of the Fossil Cycad ACEC.

ROW restrictions are greater than in Alternatives A and B and less than Alternative D. The largest acreage (199,420) is proposed for exclusion, and 73,870 acres are open. Based on these restrictions, Alternative C offers more protection than Alternatives A and B and less than Alternative D.

Renewable Energy: Under Alternative C, renewable energy development has the least potential to affect paleontological resources because it has the most restrictions preventing surface disturbance during construction. Alternative C has the largest acreage excluded (199,420 acres) and the least acreage open (73,870 acres). Greater Sage-Grouse PPAs (96,379 acres) would be excluded from renewable energy development. Much of these PPA areas overlap with high potential fossil yield areas. Additionally, commercial wind energy projects are restricted to a one mile radius of SRMAs. Compared to Alternative B, the Fossil Cycad ACEC is closed to commercial wind energy development allowing adequate protection to the paleontological resources.

OHV Use and Travel Management Areas: Alternative B designates motorized travel on 143,528 acres limited to existing roads and trails and limited to designated roads and trails on 128,224 acres, including ACECs and Travel Management Areas (Fort Meade ACEC, Exemption Area, Center of the Nation). Motorized travel would be allowed within 100 feet of roads to access campsites; motorized travel off road for big game retrieval would not be allowed. Alternative C offers the most protection to paleontological resources because it would have the least amount of area available via existing roads and trails.

Solid Minerals: Solid mineral leasing has the potential to affect paleontological resources due to the high degree of surface disturbance required to remove minerals from the ground. Based on the location of existing mining claims, leasable mineral claims would have limited to no effect on paleontological resources. Greater Sage-Grouse PPAs and the Fossil Cycad ACEC would be closed or withdrawn from further consideration for leasing, allowing the most protection to paleontological resources.

Visual Resources: Alternative C offers the most protection to paleontological resources because more acres of Class II and Class III (192,603) would prohibit surface-disturbing activities and increase protection. The remaining acreage still open to surface-disturbing activities would be Class IV (80,712) acres where adverse effects would be mitigated through inventory and monitoring. Similar to Alternative B, the Fossil Cycad ACEC would be closed or withdrawn from further consideration for leasing, allowing more protection to paleontological resources than Alternative A.

Impacts under Alternative D (Preferred Alternative)

Fluid Minerals: Alternative D has the second highest number of acres available for lease with surface restrictions on 893,527 subsurface mineral acres and 183,877 surface acres. Alternative D has the second most acres open (less than Alternative B) with CSU restrictions on 146,574 subsurface mineral acres (10,031 surface acres); and NSO lease

stipulations on 406,005 subsurface mineral acres (107,025 surface acres). There is less acreage available for lease than Alternatives A and B, but more with Alternative C since 7,304 mineral acres (6,894 surface acres) would be closed to leasing in the Bear Butte National Historic Landmark, Fossil Cycad ACEC, and Fort Meade ACEC.

Surface-disturbing activities associated with leasable mineral sales and energy exploration and development could result in mitigated impacts to paleontological resources. In addition, the potential for indirect and inadvertent impacts would increase proportionally to the amount of land available for mineral leasing and development. Of all the alternatives, Alternative D would have the least effect on paleontological resources. Surface limitations have the potential to decrease adverse effects to paleontological resources. With moderate oil and gas development, roads would be created when necessary and increase the potential for inadvertent discovery. It would not, however, have the same adverse effects that Alternatives A, B, and C would have on paleontological resources.

Forest and Woodland Products: Alternative D is the same as Alternative B in that it has the most potential to damage paleontological resources because new roads would be constructed for long-term management of areas where multiple entries are anticipated. New roads built to access forest products may cause direct effects to resources and indirect effects with increased access for illegal looting and vandalism. As in Alternatives A and B, forest product removal by sale is prohibited in the Fossil Cycad ACEC, providing better protection of paleontological resources in the ACEC than Alternative C.

Lands and Realty: Alternative D offers the second most ROW restrictions with 5,836 acres excluded; 191,704 acres subject to avoidance restrictions, allowing Alternative D to be moderately protective of paleontological resources. Alternative D also places all Special Designation Areas as Category 1 for retention, which means that these lands would not be available for sale or exchange. Category 1 – Retention would include all ACECs and NRHP-eligible archeological sites/historic districts. A benefit to paleontological resources is the retention of the Fossil Cycad ACEC. Additionally, all Greater Sage-Grouse PPAs are in ROW restriction areas where many PPAs overlap high probability areas for paleontological resources (Classes 4 and 5). Power and utility lines would be buried if they safely can be and would have direct effects on paleontological resources. However, effects are likely minimal based on inventory of projects in the Class 4 and 5 potential areas and avoidance by design.

ROW restrictions are greater than Alternatives A and B and less than Alternative C. Based on these restrictions, Alternative D offers protection similar to Alternative C, and better protection than Alternatives A and B.

OHV and Travel Management Areas: Alternative D, like Alternative B, offers the least protection for paleontological resources with more acres allowed for motorized travel off road (100 feet from roads for campsite access) increasing the potential for more effects to paleontological resources with inadvertent damage of unknown sites and illegal vandalism or looting. Alternative D designates motorized travel on existing roads and trails until subsequent travel management planning restricts motorized travel to designated routes. As in Alternatives B and C, Alternative D designates the Fossil Cycad ACEC as non-motorized, providing the best protection to paleontological resources. Impacts of Alternative B would be the same as in Alternatives A and C for game retrieval and the same as Alternative C for camp site access.

Renewable Energy: Alternative D offers protection of paleontological resources similar to Alternative C with 197,540 acres of total restrictions, and more than Alternatives A and B, with 118,904 acres of exclusion and 78,636 acres of avoidance restrictions. Similar to Alternative C, the Fossil Cycad ACEC would be closed to commercial wind energy development allowing adequate protection to paleontological resources. This alternative has fewer restrictions than Alternative C with commercial wind energy projects restricted to a 1/2 mile radius of SRMAs instead of one mile. Alternative D would provide better protection to paleontological resources than Alternatives A and B and less than Alternative C.

Solid Minerals: Solid mineral leasing has the potential to affect paleontological resources because of the high degree of surface disturbance required to remove the minerals from the ground. Based on the location of existing mining claims, leasable mineral claims would have limited to no effect on paleontological resources. Similar to Alternatives B and C, the Fossil Cycad ACEC would be closed or withdrawn from further consideration for leasing allowing the most protection to paleontological resources.

Visual Resources: Alternative D only offers 11,763 acres of Classes II and III and 261,552 acres of Class IV. Since acres in Classes II and III would prohibit most surface-disturbing activities and increase protection, effects to paleontological

resources would be more than in Alternatives A and B and less than Alternative C. Similar to Alternatives B and C, the Fossil Cycad ACEC would be designated Class II, offering the paleontological resources more protection than in Alternative A.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present surface-disturbing actions that affect paleontological resources include disturbance related to mineral exploration and development, Lands and Realty ROWs, range improvements, OHV and recreation use, and vegetation treatments for fire management and forest health. These actions have all had cumulatively adverse effects both directly and indirectly to the resource. Future project management would incorporate more in-depth assessment standards that include identification and protection of important paleontological resources from direct and indirect adverse effects.

The assessment methodology used to analyze cumulative impacts on paleontological resources includes the entire planning area and those management activities expected to occur within the planning area. Management activities occurring within the planning area are not expected to affect paleontological resources outside the planning area. It is expected that cumulative effects would be greatest in areas where there are overlapping resource uses.

Potential cumulative impacts to paleontological resources would result primarily from surface-disturbing activities that cause erosion or vibration from traffic and/or machinery, soil compaction, and landscape alteration. Such activity could result in exposure, damage, and/or destruction of paleontological resources.

The policies associated with the paleontological resource management program, which require identification and mitigation of paleontological resources prior to surface-disturbing activities, would help to reduce potential impacts. Implementation of these requirements would also increase the potential for identification, recordation, and collection of paleontological resources. However, even with identification and mitigation requirements, the potential exists for damage or destruction of previously unknown paleontological resources discovered during construction. In addition, OHV use, dispersed recreation, and other surface-disturbing activities not subject to a permitting process could result in exposure, damage, destruction, or theft of paleontological resources.

Due to the “checkerboard” pattern of ownership that characterizes the entire planning area, it is anticipated that activities (i.e., paleo-prospecting and recreational collecting) originating on private and state lands have the potential to cause substantial damage, destruction, and theft of paleontological resources, as well as result in the improper collection of scientifically important paleontological resources.

Cumulative Impacts under Alternative A (Current Management)

Alternative A would provide the least protection for paleontological resources on BLM-administered lands and would result in the greatest cumulative impacts when compared to the other alternatives. Cumulative adverse impacts to paleontological resources are anticipated to be moderate based on inventory and monitoring and based on paleontological assessments completed for all projects proposed on federal lands in accordance with BLM internal direction (IM 2008-009 and IM 2009-011).

Cumulative Impacts under Alternative B

Under Alternative B, surface-disturbing activities on BLM-administered public lands would only slightly diminish impacts and effects to paleontological resources, only slightly improving protection of paleontological resource values over Alternative A. Past and present actions that have affected and would continue to adversely affect paleontological resources include mineral exploration and development; range improvements; Lands and Realty ROWs, OHV and recreation use, and vegetation treatments for fire management and forest health. These actions have cumulative impacts on paleontological resources through surface disturbance that contributes to erosion and subsequent sedimentation; exposure of fossil resources with the removal of vegetation cover; and better vehicular access to paleontological site areas that could lead to looting or vandalism. RFDs would be the same as described under Impacts Common to All Alternatives and would create similar impacts due to surface disturbances.

Alternative B would provide better protection for paleontological resources on BLM-administered lands and would result in fewer cumulative impacts when compared to Alternative A. Cumulative adverse impacts to paleontological resources would be minor to moderate based on paleontological assessments completed for all projects proposed on federal lands in accordance with BLM internal direction (IM 2008-009 and IM 2009-011).

Cumulative Impacts under Alternative C

Under Alternative C, surface-disturbing activities on BLM-administered public lands would greatly reduce impacts and effects to paleontological resources and greatly improve protection of paleontological resource values over the other alternatives. Alternative C would provide the best protection for paleontological resources on BLM-administered lands and would result in the least cumulative impacts when compared to the other alternatives. Cumulative adverse impacts to paleontological resources are anticipated to be minor based on paleontological assessments completed for all projects proposed on federal lands in accordance with BLM internal direction (IM 2008-009 and IM 2009-011).

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D compares with Alternative B for larger amounts of surface-disturbing activities on BLM-administered public lands than Alternative C and less than Alternative A and would only slightly diminish impacts to paleontological resources and only slightly improve protection of paleontological resources values over Alternative B. Alternative D would provide better protection for paleontological resources on BLM-administered lands and would result in fewer cumulative impacts when compared to Alternatives A and B and less than Alternative C. Cumulative adverse impacts to paleontological resources are anticipated to be minor to moderate based on paleontological assessments completed for all projects proposed on federal lands in accordance with BLM internal direction (IM 2008-009 and IM 2009-011).

Visual Resources

An effect to the visual quality of the landscape occurs when a management activity creates noticeable surface disturbance that contrasts with the form, line, color, or texture in the landscape. For the purpose of this analysis, short-term impacts occur within five years of a given management action. Long-term impacts continue past five years or take more than five years to materialize. The level of effect will be identified by classifying from none or negligible to high or major. Visual impacts will be analyzed by the type and extent of disturbance, and each of the alternative impacts will disclose differences in amount (acres).

Allowable uses and management actions that could affect visual resources include surface development and associated infrastructures such as range improvement projects, vegetation management, or more intensive activities such as oil and gas development. Most oil and gas development is expected in the high and moderate RFD areas of Butte, Harding, and Fall River counties. Small-scale, dispersed development (range improvements) would have a lesser impact due to the ability to fit these facilities into natural landscapes. Visual resources in areas with a high potential for oil and gas development are likely to be more heavily impacted over the long term.

Assumptions

Assumptions and guidelines used in this impact analysis include the following:

Future development and other land use activities described under each alternative are compared to recommended VRM classes and existing visual conditions to determine potential effects. For example, because Class III and Class IV lands allow for moderate to high modifications to the landscape, more Class III and Class IV land designated in an alternative, coupled with projected surface-disturbing acres, would result in a higher amount of moderate to high landscape modifications and visual resource effects (VRM classes are defined in the Glossary).

Resource protective measures that eliminate obvious new surface-disturbing actions protect the existing visual resources and scenic quality of the landscape.

VRM objectives would be applied to all management actions, and appropriate mitigation measures would be developed to comply with established visual resource class objectives.

Short-term effects on visual quality may occur for long-term resource benefit.

Actions that occur on lands not administered by the BLM (regardless of ownership) may affect visual resources; however, only actions and impacts on BLM-administered land are considered.

Vegetation treatments designed to reduce wildfire risk would reduce the severity and acres of wildfire.

Table 4-42 depicts approximate acreage by VRM class for each alternative.

Table 4-42
VRM Classes by Alternative
(Acres)

VRM Class	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
I	0	0	0	0
II	1,231	1,544	11,657	1,544
III	4,993	5,284	179,212	10,367
IV	531	264,924	80,883	259,841
No Designation	264,997			

Impacts Common to All Alternatives

All of the alternatives could meet the management goal for visual resources, which is to manage BLM land and activities consistent with VRM objectives. Potential effects could occur under all alternatives on a site-specific basis from activities such as oil and gas development, including night lighting, grazing, fuel reduction treatments, lands and realty actions, mining, recreation, OHV use, and fire suppression. However, by following BMPs and mitigations for specific projects, the degree or level of effects to visual resources would be minimized. Appendix F displays the visual values used in identifying inventory ratings, by alternative in acres.

Fire Management and Ecology: All of the alternatives include prescribed burns and mechanical vegetation treatments to reduce fire risk and restore ecosystem function. No long-term acres are projected to be disturbed because of reclamation activities and regrowth of vegetation.

Surface disturbance from prescribed fire would improve the health of the land but would leave a blackened landscape, produce smoke, and add temporary two-track suppression roads in the treated area. Although this land treatment would have a short-term minor effect on visual resources by creating changes in the form, line, color, and texture of the burned landscape, long-term benefits from improving the health of the land far outweigh adverse effects from the initial prescribed burn. Generally, long-term benefits to improving the health of the land would include reducing wildfire risk, improving vegetation composition and wildlife habitat which, in turn, would likely improve scenic quality and increase recreational opportunities for wildlife viewing, hiking, and hunting. Prescribed fire would be used throughout the planning area during the life of the RMP. Prescribed fire would occur during any season when fuels are within acceptable burning standards.

Surface disturbance from mechanical treatments would include thinning stands of trees and treating the residue. Reduction in tree density, change in species dominance, damage to residual trees, timber harvest machinery, log deck and landing creation, increase or use of roads, chip production, and slash pile production may potentially affect visual resources. Effects would likely be relatively short-term due to the nature of regrowth and use of visual resource considerations in layout and treatment choice. Long-term benefits of reducing fire risk and potential, improving stand resiliency, and enhancing wildlife habitat outweigh short-term impacts. Improved stand health would help maintain a

characteristic landscape for the visual resource. Forest mechanical treatments would occur primarily in timbered areas of the Fort Meade ACEC and the Exemption Area, but may occur in woodlands throughout the planning area.

Minerals – Solid, Locatable/Leasable: The SDFO estimates that 87 acres of BLM-administered surface are projected to be disturbed by BLM-authorized solid mineral locatable actions over the life of the RMP under all alternatives. These surface-disturbing actions are associated with extracting bentonite and would excavate small to moderate open pits on the landscape and new roads to access the pits. No long-term acreage is projected to be disturbed in pit areas because of implementation of reclamation activities. Roads may have a long-term moderate impact since they would not be reclaimed until the pit closes.

Bentonite resources are present in multiple geological formations at the surface in a large portion of the planning area. However, mining has historically occurred in Butte County, north of the Black Hills near Highway 212. Development would likely move north slowly from that area. The existing processing plant location, hauling costs, and depth to beds are important factors influencing future development. Where pits and other disturbances occur, visual resources would be moderately affected by creating changes in the form, line, color and texture of the landscape. These visual effects could affect scenic quality and may degrade recreational opportunities and experiences primarily during the fall hunting season and, to a lesser degree, during spring and summer, when people enjoy pleasure driving, hiking, and wildlife viewing near these surface-disturbing activities. After mineral extraction and reclamation of these pits are complete, these effects would be reduced.

Minerals - Fluid, Leasable: Oil and natural gas developments would have a major long-term impact to the visual resource. The necessary road network would create noticeable changes, particularly in the line and color of the landscape. Structures would create contrast in the landscape. Reclamation would be required as part of the lease agreement. The amount of impact would vary by alternative.

Forest and Woodland Products: The sale and removal of forest products requires access so increased road use and possible new road construction, along with the associated dust, would potentially cause moderate short-term impacts to visual resources. Road use and maintenance is allowed under all alternatives. Increased traffic would be short-term, lasting three years or less on an intermittent basis. The requirements of timber sale contracts or regular maintenance would reduce dust impacts to short-term, often only days, until a treatment is applied to minimize dust. Changes in color and texture may be major and long-term when restoring prairie or oak savannah ecosystems. The change would be considered beneficial in the very long term due to ecosystem sustainability. The differences in acres/volumes between alternatives are negligible; however, the access to commercially treat does vary by alternative.

Lands and Realty: The transfer or exchange of land that results in a more consolidated BLM ownership pattern improves the BLM's ability to manage visual resources. Visual resources are considered at the characteristic landscape basis. Where the ownership pattern is fragmented, it is difficult to fully manage visual resources because the flexibility in design and location is often limited. All alternatives allow land transfer or exchange. The consolidation of ownership pattern would be a benefit to visual resource management and would be one of the criteria considered in land transfers.

Burial of utility lines may cause a short-term minor impact due to ground disturbance; however, this impact is less intrusive than overhead lines. Alternatives vary in their requirements for utility line burial; however, it would be allowed in all alternatives, and potential impacts would be expected throughout the planning area.

Livestock Grazing: At least two BLM-authorized range improvement projects are estimated to be constructed annually for all the alternatives. No long-term acreage is projected to be disturbed because of reclamation activities. These projects include constructing fences, wells, and small reservoirs throughout the planning area. Actual construction of these range improvements would increase soil and vegetation disturbance and possibly fragment the landscape by constructing barriers (fences). New roads may be created to access range improvements during construction. Range improvements could affect visual resources by adding forms, lines, colors, and textures that would not be found in the surrounding landscape. This may moderately affect scenic quality and degrade recreational opportunities and experiences where rangeland improvements are constructed. Potential effects would be the greatest during the fall hunting season and, to a lesser degree, during spring and summer when people enjoy pleasure driving, hiking, horseback riding, and wildlife viewing. The difference in acreage between alternatives is negligible.

Recreation: The site selection and design of recreational developments, facilities, and projects could affect visual resources in the long term through the introduction of forms, lines, colors, and textures that contrast with the characteristic landscape. However, these developments, facilities, and projects would be planned to minimize potential contrasts and meet area VRM objectives. Dispersed recreation activities could negligibly strengthen existing line, form, and color contrast through the use of existing roads, trails, and campsites. Closure and/or rehabilitation of undeveloped sites and roads would restore the visual resources of specific sites.

Impacts under Alternative A (Current Management)

Fire Management and Ecology: Approximately 213 acres would be treated annually by prescribed burns. In addition, approximately 346 acres of BLM-administered surface are projected to be disturbed by mechanical treatments annually over the life of the RMP. Alternative A proposes the least activity and, therefore, the fewest potential short-term impacts. However, due to the least acreage treated, it also has the greatest potential for long-term uncontrolled visual resource impacts from wildfire.

Fluid Minerals – Leasable: Approximately 82 acres of BLM-administered surface would have short-term disturbance from BLM-authorized oil and gas development over the life of the RMP. Approximately 49 acres would have long-term disturbance from BLM-authorized oil and gas development over the life of the RMP (Tables 4-23 and 4-24). These surface-disturbing actions would create new roads and visual intrusions from gas sheds, compressor stations, and lighting which would affect visual resources by creating changes in the form, line, color and texture of the landscape. Existing laws, regulations, and policies would minimize effects from oil and gas development to visual resources through mitigation. Effects would be reduced by utilizing VRM class objectives to provide the basis for allowable changes in form, line, color, and texture; however, analyses would be done on a case-by-case basis, as VRM classes would not be designated. This could lead to future deferral at the time of project permit application in order to identify visual management objectives. Effects to visual resources would occur most in high and moderate potential oil and gas development areas in Harding and Perkins counties and would continue throughout the life of the RMP or the term of well leases.

Approximately 6,894 acres of BLM-administered surface would be closed to fluid mineral leasing, and 15,489 acres of BLM-administered would be open subject to NSO. This would protect visual resources from surface-disturbing actions throughout the planning area. These protective measures would have a beneficial effect on scenic quality for dispersed recreational opportunities during the fall hunting season and, to a lesser degree, during spring and summer when people enjoy pleasure driving, hiking, horseback riding, and wildlife viewing.

Forest and Woodland Products: New road construction would be allowed and impacts on visual resources would be analyzed at the project level.

Lands and Realty: Approximately 136 acres of BLM-administered surface would have short-term disturbance by BLM-authorized ROWs. Approximately 79 acres of BLM-administered surface acres would have long-term disturbance throughout the life of the RMP (Tables 4-23 and 4-24). ROWs, leases, and permits would be granted for surface-disturbing actions related to development (i.e., utility lines, communications sites, pipelines, and oil and gas). These surface-disturbing activities associated with ROWs, leases, and permits would create new roads and visual intrusions from power lines and communications sites, affecting visual resources by creating changes in form, line, color, and texture of the landscape.

Travel Management: Alternative A continues current travel management designations with 264,706 acres limited to existing roads and trails and 7,046 acres in ACECs limited to designated roads and trails. Motorized travel would be allowed within 300 feet of roads to access campsites, and cross-country motorized travel for big game retrieval would not be allowed.

OHV activities can affect visual resources if these uses cause vegetation loss, soil exposure, or erosion. OHV use on designated or existing roads and trails could increase color contrasts between the travel surface and surrounding vegetation through continued vegetation loss and soil erosion. Since OHV travel is currently limited to existing tracks, the effect of this alternative is minor, but long-term.

Renewable Energy: Alternative A would result in the most acreage disturbed by renewable energy development. Approximately 924 acres of minor short-term disturbance and 231 acres of major long-term disturbance are expected as a result of BLM-authorized renewable energy actions. As shown in Tables 4-23 and 4-24, total acreage affected would be much higher than the acreage projected to be disturbed in Alternatives B, C, and D. These surface-disturbing activities would be associated with wind energy development that would create new roads, increase soil erosion and vegetation loss, and create large visual intrusions from construction of wind turbines and power lines. These would affect visual resources by adding vertical lines and linear and complex forms to the landscape in high wind energy potential areas within the planning area.

Visual Resources: Under current management, there is no VRM designation on over 264,000 acres of the Decision Area, so visual resource management on these acres would be on a case-by-case basis during project planning. This lack of determination now may lead to a deferral for identifying visual management objectives at the time of project permit application. Class IV is designated on 531 acres, Class III is designated on 4,993 acres, and Class II is designated on 1,231 acres. Under current management there are no VRM Class I areas within the planning area.

Alternative A would allow for the most haphazard landscape modifications and detrimental visual resource impacts of any alternative. The fewest acres of protective resource measures for existing visual resources would allow the greatest changes in the form, line color, and texture of the landscape.

Impacts under Alternative B

Fire Management and Ecology: Approximately 1,000 acres would be treated annually by BLM ignited prescribed burns. In addition, approximately 400 acres of BLM-administered surface are projected to be disturbed by mechanical treatments annually over the life of the plan. This alternative has the most proposed activity and therefore the greatest potential for short-term major impacts. However, due to the most acres treated it also has the greatest potential for reducing long-term uncontrolled visual resource impacts from wildfire.

Fluid Minerals – Leasable: Approximately 65 acres of major short-term disturbance and 39 acres of major long-term disturbance is expected to occur on BLM-administered surface estate as a result of BLM-authorized oil and natural gas development actions over the life of the plan. These surface-disturbing actions associated with development of new oil and gas wells would create new roads and visual intrusions from gas sheds and compressor stations, and add lighting, which would affect visual resources by creating changes in the form, line, color and texture of the landscape. Existing laws, regulations, and policies would minimize the effects to visual resources from oil and gas development activities through mitigation. Effects could also be reduced by utilizing VRM class objectives to provide the basis for allowable changes in form, line, color, and texture. The effects to visual resources would mostly occur within the high and moderate potential areas for oil and gas development in Harding and Perkins counties and would continue throughout the life of the RMP or term of the leased wells.

Approximately 6,574 acres of BLM-administered surface would be closed to fluid mineral leasing, and 105,837 acres of BLM-administered surface would be open subject to NSO. This would have the effect of protecting the existing visual resources from natural gas development surface-disturbing actions throughout the planning area. These protective measures would have a beneficial effect on scenic quality for dispersed recreational opportunities during the fall hunting season, and to a lesser degree during the spring and summer for publics who enjoy pleasure driving, hiking, horseback riding and viewing wildlife.

Forest and Woodland Products: New road construction would be allowed and designed with the visual resource impacts minimized due to the management class requirements. New road construction would be a moderate long-term impact to the visual resource. Sale amounts are approximately equal between Alternatives A and B.

Lands and Realty: Approximately 133 acres of short-term disturbance and 77 acres of long-term disturbance are expected to occur as a result of BLM-authorized ROW actions throughout the life of the RMP. ROWs, leases and permits would be granted for surface-disturbing actions such as utility lines, communications sites, pipelines, and oil and natural gas development. These surface-disturbing actions associated with ROW leases and permits would create new roads and visual intrusions from power lines and communications sites, and would moderately affect the visual resources over the long term by creating changes in the form, line, color and texture of the landscape.

Travel Management: Alternative B designates 259,623 acres (95 percent) as limited to existing roads and trails. OHV use would be limited to designated roads and trails in the ACECs and the SRMA Exemption Area (12,129 acres). Motorized travel would be allowed within 300 feet of roads to access a campsite. Motorized game retrieval would be allowed up to 300 feet from existing roads.

OHV activities can affect the visual resources on a minor, short-term basis if these uses cause vegetation loss, soil exposure, or erosion. OHV use on designated or existing roads and trails could increase color contrasts between the travel surface and the surrounding vegetation through continued vegetation loss and soil erosion. Cross-country motorized travel for game retrieval has potential to create contrast with the characteristic landscape in color and linear forms for a 600 foot corridor along each road.

Renewable Energy: Approximately 768 acres of short-term disturbance and 192 acres of long-term disturbance are expected to occur as a result of BLM-authorized renewable energy actions. These surface-disturbing actions are associated with development of wind farms, which would create new roads, increase soil erosion and vegetation loss, and create large visual intrusions from construction of wind turbines and power lines which would affect the visual resources by adding vertical lines and linear and complex forms to the landscape in high wind energy potential areas within the planning area.

Visual Resources: Under Alternative B, lands managed under VRM Class IV would be identified and cover most (97 percent) of the planning area (264,924 acres). The Fort Meade ACEC VRM designation would be completed, increasing VRM Class III to 5,284 acres. Designation on the Fossil Cycad ACEC would change to Class II, bringing the total to 1,544 acres. The change to Class II on the Fossil Cycad ACEC is an acknowledgment that although major change to the landscape (Highway 18) has occurred, management in the future would not result in such major changes. This alternative designates the VRM classes on all BLM-managed acres, improving the ability to manage changes to the characteristic landscape. This alternative is more protective than Alternative A, but less protective than Alternatives C or D for visual resources.

Impacts under Alternative C

Fire Management and Ecology: Approximately 500 acres annually would be treated by BLM-ignited prescribed burns. In addition, approximately 350 acres of BLM-administered surface are projected to be disturbed by mechanical treatments annually over the life of the RMP. This alternative has an intermediate amount of proposed activity and therefore an intermediate level of potential short-term impacts, as well as an intermediate potential for long-term uncontrolled visual resource impacts from wildfire.

Fluid Minerals – Leasable: Approximately 63 acres of short-term disturbance and 38 acres of long-term disturbance are expected to occur on BLM-administered surface estate as a result of BLM-authorized leasing. These surface-disturbing actions associated with development of new oil and gas wells would create new roads and visual intrusions from gas sheds and compressor stations, and add lighting, which would affect visual resources by creating changes in the form, line, color and texture of the landscape. Existing laws, regulations, and policies would minimize effects from oil and gas development activities to visual resources through mitigation. Effects could also be reduced by utilizing VRM class objectives to provide the basis for allowable changes in form, line, color, and texture. Effects to visual resources would mostly occur within the high and moderate potential areas for oil and gas development in Harding and Perkins counties and would continue throughout the life of the RMP or term of the leased wells.

Approximately 100,160 acres of BLM-administered surface would be closed to fluid mineral leasing, and 43,897 acres of BLM-administered would be open subject to NSO. This would have the effect of protecting existing visual resources from natural gas development surface-disturbing actions throughout the planning area. These protective measures would have a beneficial effect on scenic quality for dispersed recreational opportunities during the fall hunting season and to a lesser degree during the spring and summer for publics who enjoy pleasure driving, hiking, horseback riding and viewing wildlife.

Forest and Woodland Products: New road construction would be prohibited under this alternative, reducing potential impacts. Visual resource impacts from the sale of forest products would be least in this alternative, as would the sale amounts.

Lands and Realty: Approximately 88 acres of short-term disturbance and 51 acres of long-term disturbance are expected to occur on BLM-administered surface estate as a result of BLM-authorized ROW actions throughout the life of the RMP. No long-term acres are projected to be disturbed because of implementation of reclamation activities. ROWs, leases and permits would be granted to development of surface-disturbing actions such as utility lines, communications sites, pipelines, and oil and natural gas development. These surface-disturbing actions associated with ROW leases and permits would create new roads and visual intrusions from power lines and communications sites, and would affect the visual resources by creating changes in the form, line, color and texture of the landscape.

Travel Management: This alternative designates motorized travel on 143,528 acres (53 percent of the planning area) as limited to existing roads and trails. Motorized travel is identified as limited to designated roads and trails on 128,224 acres (47 percent of the planning area), including ACECs and Travel Management Areas (Fort Meade ACEC, Exemption Area, Center of the Nation). Motorized travel would be allowed within 100 feet of roads to access a campsite. Motorized travel off road for big game retrieval would not be allowed.

OHV activities can affect visual resources if these uses cause vegetation loss, soil exposure, or erosion. OHV use on designated or existing roads and trails could increase color contrasts between the travel surface and the surrounding vegetation through continued vegetation loss and soil erosion.

Renewable Energy: This alternative would result in the most acres affected by renewable energy development. Approximately 588 acres of short-term disturbance and 78 acres of long-term disturbance are expected to occur on BLM-administered surface estate as a result of BLM-authorized renewable energy actions. These surface-disturbing actions are associated with the development of wind farms, which would create new roads, increase soil erosion and vegetation loss, and create large visual intrusions from construction of wind turbines and power lines. These installations would affect visual resources by adding vertical lines and linear and complex forms to the landscape in high wind energy potential areas within the planning area.

Visual Resources: Alternative C would designate VRM Class II on 4 percent (11,657 acres) of the planning area, to include the Fossil Cycad ACEC, Fort Meade Backcountry Byway and acres inventoried as Class II. Approximately 66 percent (179,212 acres) would be designated VRM Class III, allowing moderate change to the characteristic landscape. Class III areas include portions of the Fort Meade ACEC, the Two Rivers area, portions of the Exemption Area not included in Class II, Dogie Butte, the BLM ridgeview in Fall River County, Center of the Nation, Cedar Canyon, BLM-administered land adjacent to Battle Mountain, a one-mile buffer on Highway 85, and a 1/2 mile buffer on sagebrush dominated land. Approximately 30 percent (80,883 acres) would be designated as VRM Class IV, allowing major changes to the characteristic landscape.

Impacts under Alternative D (Preferred Alternative)

Fire Management and Ecology: Approximately 1,000 acres annually would be treated by BLM-ignited prescribed burns. In addition, approximately 400 acres of BLM-administered surface are projected to be disturbed annually by mechanical treatments over the life of the RMP. This alternative has the most proposed activity and therefore the greatest potential for short-term impacts. However, due to the most acres treated it also has the greatest potential for reducing long-term uncontrolled visual resource impacts from wildfire.

Fluid Minerals – Leasable: Approximately 65 acres of short-term disturbance and 39 acres of long-term disturbance are expected to occur on BLM-administered surface estate as a result of BLM authorized oil and natural gas development actions over the life of the RMP. These surface-disturbing actions associated with development of new oil and gas wells, would create new roads and visual intrusions from gas sheds, compressor stations, and lighting, which would affect visual resources by creating changes in the form, line, color and texture of the landscape. Existing laws, regulations, and policies would minimize effects from oil and gas development activities to visual resources through mitigation. Effects could also be reduced by utilizing VRM class objectives to provide the basis for allowable changes in form, line, color, and texture. Effects to visual resources would mostly occur within the high and moderate potential areas for oil and gas development in Harding and Perkins Counties and would continue throughout the life of the RMP or term of the leased wells.

Approximately 6,894 acres of BLM-administered surface would be closed to fluid mineral leasing, and 107,025 acres of BLM-administered would be open subject to NSO. This would have the effect of protecting existing visual resources from natural gas development surface-disturbing actions throughout the planning area. These protective measures would have a beneficial effect on scenic quality for dispersed recreational opportunities during the fall hunting season and to a lesser degree during the spring and summer for publics who enjoy pleasure driving, hiking, horseback riding and viewing wildlife.

Forest and Woodland Products: New road construction is allowed and designed with the visual resource impacts minimized due to the management class requirements. Sale amounts are approximately equal between alternatives.

Lands and Realty: Approximately 133 acres of short-term disturbance and 77 acres of long-term disturbance are expected to occur on BLM-administered surface estate as a result of BLM-authorized ROW actions throughout the life of the RMP. ROWs, leases and permits would be granted for surface-disturbing actions such as utility lines, communications sites, pipelines, and oil and natural gas development. These surface-disturbing actions associated with ROW leases and permits would create new roads and visual intrusions from power lines and communication sites, and would affect visual resources by creating changes in the form, line, color and texture of the landscape.

OHV Use and Travel Management Areas: Alternative D identifies three Travel Management Areas, the Fort Meade ACEC, Exemption Area, and Center of the Nation. Subsequent travel management would limit motorized travel to designated roads and trails in these Travel Management Areas. In addition, coordination with the State of South Dakota for walk-in hunting areas would result in limiting motorized travel to designated roads on adjacent BLM land. Because walk-in hunting agreements change annually, the current acreage may be considered representative, rather than absolute. OHV use would be limited to designated roads in the Fossil Cycad ACEC. The remaining area would limit motorized travel to existing roads and trails. Motorized travel to access a campsite would be allowed up to 100 feet from a designated road or existing road, depending on Travel Management Area decisions. Motorized travel for game retrieval would not be allowed.

OHV activities can affect visual resources if these uses cause vegetation loss, soil exposure, or erosion. OHV use on designated or existing roads and trails could increase color contrasts between the travel surface and the surrounding vegetation through continued vegetation loss and soil erosion. Restricting motorized travel to designated roads in Travel Management Areas would limit the visual contrasts supplied by roads. Prohibiting cross-country motorized travel for game retrieval, where hunting is the largest recreational use of the land, eliminates the potential to create contrast with the characteristic landscape in color and linear forms for a 600 foot corridor along each road.

Renewable Energy: Approximately 130 acres of short-term disturbance and 520 acres of long-term disturbance are expected to occur on BLM-administered surface estate as a result of BLM-authorized renewable energy actions. These surface-disturbing actions are associated with development of wind farms, which would create new roads, increase soil erosion and vegetation loss, and create large visual intrusions from construction of wind turbines and power lines that would affect visual resources by adding vertical lines and linear and complex forms to the landscape in high wind energy potential areas within the planning area.

Visual Resources: Alternative D would designate VRM Class II on less than 1 percent (1,544 acres) of the planning area to include the Fossil Cycad ACEC and Fort Meade Backcountry Byway. Approximately 4 percent (10,367 acres) would be designated VRM Class III, allowing moderate change to the characteristic landscape. Class III areas include portions of the Fort Meade ACEC and the Exemption Area. Class III designation would be consistent with management of the BLM public land in the Exemption Area as a SRMA. Nearly 96 percent (259,841 acres) would be designated as VRM Class IV, allowing major changes to the characteristic landscape. Resource use and development, as well as specific management concerns were considered in this alternative. Certain management restrictions (buffer zones, NSO) would reduce visual impacts as well as their intended effect of wildlife habitat protection.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present surface-disturbing actions that would affect visual resources include mineral exploration and development, Lands and Realty ROWs, range improvements, OHV and recreational use, and vegetation treatments for fire management and forest health. In general, these actions have had, and would continue to have, moderate cumulative adverse effects on visual resources by creating changes to the form, line, color, and texture of the landscape. The level of development has been low and the dispersed development pattern has resulted in only some localized changes to the visual characteristics.

Resource protective measures that eliminate or visually modify new surface-disturbing actions protect existing visual resources and the scenic quality of the landscape.

Cumulative Impacts under Alternative A (Current Management)

Alternative A would continue to allow the highest acreage of projected surface-disturbing actions of all the alternatives and the least acres of protective resource measures. Reasonably foreseeable development in the planning area would have the greatest adverse effects on the form, line, color, and texture of the landscape under this alternative due to the lack of visual management guidance.

Cumulative Impacts under Alternative B

Alternative B would allow for an intermediate amount of projected surface-disturbing actions of all the alternatives and an intermediate amount of acres of protective resource measures. Because these and other RFD actions from federal, state, private and other lands within and adjacent to the planning area would have adverse effects on visual resources by creating changes to the form, line, color, and texture of the landscape, the total cumulative impact to visual resources would be less than Alternative A and greater than Alternatives C and D.

Cumulative Impacts under Alternative C

Alternative C would allow greater modification to visual resources on about 96 percent of the planning area, while 4 percent would be more protected with the VRM Class II. This is greater protection than Alternatives A or B, but less than Alternative D.

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D would not provide as much protection of the visual resources through VRM designation as Alternative C. Only minor or moderate changes would be acceptable in key visual areas, while modifications may be more apparent in resource use areas. Visual concerns would be considered for all treatments and developments; however, there would be more potential for visual intrusions.

Fire Management and Ecology

The overriding priorities of fire and fuels management are firefighter and public safety and to protect or enhance natural resources and values. Fire and fuels management strategies focus on these priorities and encourage the use of vegetation treatments to accomplish them.

Assumptions

Assumptions were made to aid in the analysis of predicted impacts. Assumptions are based on previous events and experience of BLM fire management personnel and their knowledge of resources in the planning area.

The natural or historical range of fire frequency/severity maintains vegetation structure, health, fuel loads, and fire size/behavior in all but the most severe weather and drought conditions. Fire and other vegetation treatments could improve and/or maintain healthy disturbance regimes on the landscape, improve vegetation health, and decrease hazardous fuel loadings.

Vegetation treatments in forests, woodlands, and juniper shrublands alter fire behavior/severity by reducing ladder fuels and decreasing canopy cover, thereby inhibiting vertical fire spread and reducing the risk of crowning, spotting, and high intensity fire. These treatments are especially helpful in urban interface, rural intermix, or other developed areas. Treatments affect resources and fire management in the following ways:

- Mitigate unnatural fire behavior and undesirable effects to resources;
- Support fire suppression activities by adding a measure of safety and operational options;
- Decrease adverse impacts to resources from suppression actions; and
- Restore appropriate fire regimes.

Treatment acres analyzed for fire and fuels management include both mechanical treatments and prescribed fire treatments in all vegetation types across the planning area. Most mechanical treatments in forested areas would occur in the Fort Meade ACEC and Exemption Area, but for fire and fuels analysis, mechanical treatments include acres across the entire planning area. Based on past experiences, knowledge, and history of the fire management program by BLM personnel within the planning area, acres treated by alternative were developed. The acres were derived taking into account budget, past performance, personnel constraints, and personnel judgment.

In areas with the highest departures from natural or historical disturbance regimes/conditions (such as fire frequency/severity), inaction or reduced actions could exacerbate or expand acres of undesirable conditions. Fire regimes and condition classes have been assessed for the entire planning area utilizing the approved Interagency FRCC Guidebook (version 1.3.0, January 2008) methods. This methodology will be used to develop baseline conditions for the planning area and to monitor management actions during the life of the RMP.

For any sensitive resource, restrictions to surface-disturbing or disruptive activities would likely not affect vegetation treatments in terms of total acres, but location or timing constraints could apply. Any surface disturbance, including the use of heavy equipment, would have the potential to affect significant cultural resources. Surface-disturbing activities would also have the potential to discover sites that would otherwise be unknown by locating sites that were buried or not found during review inventory. Adherence to cultural resource laws and regulations, in most instances, would minimize and mitigate these effects.

In managing noxious and invasive species, prompt actions to control cheatgrass and other annual bromes could benefit fire suppression efforts by reducing fuel load and the rate of fire spread in a wildfire.

Buried infrastructure such as power lines would benefit fire management activities by reducing hazards and complexity during operations.

Developed recreation in SRMAs may constrain implementation of landscape level forest health treatments because of other multiple-use priorities. Alternatively, developed sites such as campgrounds may become high priority for fuels reduction treatments.

Increased off-road travel such as game retrieval and permitted OHV activities could increase the risk of human-caused ignitions, likely by equipment but also by increasing chances of other accidental fire starts.

Permanent road building requirements could cause delays in some forest health and fuels reduction activities. Alternatively, new roads or increased maintenance of existing roads would improve access for fire suppression and fuels management activities and would create barriers to fire spread, especially in grass/shrubland areas.

For livestock grazing, a minimum rest period of up to two growing seasons after vegetation treatments may unnecessarily postpone or constrain vegetation health treatments, whereas rest periods determined at the activity level could enhance site-specific management.

Actively managing noxious and invasive vegetative species with IPM methods, including early spring grazing and prescribed fire, could benefit fire suppression efforts by reducing fuel load and the rate of spread in the event of wildfire.

Impacts Common to All Alternatives

Under any alternative, location and/or timing constraints may apply to implementing vegetation treatments or wildfire suppression options because of sensitive resources. Some examples include:

- highly erodible soils;
- priority wildlife habitat;
- invasive species;
- Class II VRM areas;
- range management restrictions;
- Class 1 airsheds; and
- paleontological and cultural resources.

For any activity, interdisciplinary planning would identify mitigation measures or constraints necessary for successful implementation.

In some cases there are no cumulative impact concerns as the activities on all lands are minimal, are occurring through the course of many years, and are occurring in different watersheds or locations.

Travel Management: Off-road game retrieval would be considered through travel management planning. If allowed in portions of the planning area, off-road travel could present more potential for human caused fire starts.

Recreation: Managing the Fort Meade ACEC and Exemption Area as a SRMA would likely not affect forest health and hazardous fuels treatments.

Special Designations: ACECs managed for cultural, soils, and/or wildlife objectives could conflict with vegetation treatments and fire regime/condition class goals because of location or timing constraints. However, projects would likely be accomplished through mitigation measures.

Impacts under Alternative A (Current Management)

Fire Management and Ecology: Forest and rangeland vegetation treatments would average about 559 acres per year in the planning area, where 346 acres would be treated mechanically and about 213 acres would be treated with prescribed fire. For the 20-year life of the RMP, total acres treated would be about 11,180 acres or about 4 percent of BLM-administered lands in the planning area.

Limiting or prohibiting 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; fire frequency, severity, and pattern.

Allowing for vegetation and forestry product management activities would be a benefit to a successful fuels management program by allowing for the improvement and maintenance of ecosystem functionality.

Opportunities to improve fire regime condition classes at the landscape level are minimal in this alternative because mechanical and prescribed fire treatments would remain at current levels. Forested acres treated would continue to target developed areas in the wildland urban interface, with small-scale treatment opportunities in undeveloped areas for forest health, rangeland health, and wildlife habitat improvement or protection. At the landscape level, treatments would not be keeping pace with vegetation growth/disturbance cycles. The scale of treatments would continue to exacerbate or expand poor forest/rangeland health conditions, ecosystem functionality, biological diversity, and fire risk. The diversity of native species populations and habitats would continue to decline and risk of endangerment would potentially increase.

Vegetative Communities: Land treatments would be done to meet watershed, grazing management, and wildlife objectives and would not be done to achieve or maintain natural fire regimes and condition classes.

Transportation and Access: Permanent road construction for forestry and fuel treatments would be allowed. New roads or increased maintenance of existing roads would improve access for fire suppression and fuels management activities and would create barriers to fire spread, especially in grass/shrubland areas. Road construction could potentially cause some delays when implementing forest health and fuels reduction activities. More opportunities would exist for human-caused fire ignitions. Compared to the other alternatives, the potential for fire ignitions as a result of vehicular travel cross country would be intermediate as cross-country travel would not be allowed for game retrieval but would be allowed for camping purposes.

Visual Resources: Alternative A has the least potential constraint of all the alternatives from VRM Class II. The small amount of VRM Class II could provide some minor constraints in meeting landscape level objectives. Any vegetation treatment would have a short-term effect on visual resources but the long-term benefits of the treatments would far outweigh smaller short-term effects.

Impacts under Alternative B

Fire Management and Ecology: Forest and rangeland vegetation treatments would average about 1,400 acres per year, where 400 acres would be treated mechanically and about 1,000 acres would be treated with prescribed fire. For the 20-year life of the RMP, the total acres treated would be about 28,000 acres, or about 10 percent of BLM-administered lands in the planning area.

As in Alternative D, this alternative would provide good opportunity to expand mechanical and prescribed fire treatments throughout the planning area. Acres treated would continue to target developed areas, but would also target more remote areas to improve forest/rangeland health and improve or protect other resources. During the life of the RMP, progress could be made toward restoring landscape forest health, fire regimes, and improving and/or maintaining condition class, as 28,000 acres would be treated across the planning area. This alternative provides the greatest opportunity to reduce the risk of crown fire and insect outbreaks, restore and/or improve watershed function and condition, increase biological diversity, and improve ecosystem functionality/resilience and health at a landscape level. Developing and implementing treatments on a landscape approach would be the most beneficial and logical approach because fire is a spatial process whose spread and severity is strongly influenced by a variety of landscape features. This alternative would provide the greatest protection and mitigation direction for fire, wildlife, aquatic, watershed, and cultural resources while improving or maintaining the greatest number of acres that are in condition class 2 or 3. The ability to treat the greatest number of acres across the landscape would provide the greatest benefit to the multitude of resources that are present within the planning area.

Forest and Woodland Products: For forest health treatments, see text above under Fire Management and Ecology.

Special Status Species: Prescribed burning would be allowed in Greater Sage-Grouse PPAs if the activity would benefit sagebrush communities. This would allow greater flexibility and opportunities to meet multiple fire management and other resource objectives throughout the planning area. Buried power lines, which would reduce effects to sage-grouse and sagebrush habitats, would also benefit fire management activities by reducing hazards during fire and fuels activities.

Vegetative Communities: Rest periods from livestock grazing up to one year prior to treatment and up to one growing season following treatments could be used to promote vegetation recovery and would benefit fire and fuels management. Adaptive management at the project level could allow grazing prior to recommended rest periods when an interdisciplinary team determines this action is needed.

In addition to watershed, grazing management, and wildlife objectives, land treatments would be used to achieve, maintain, and/or improve fire regimes and condition classes which specifically benefits fire and fuels management.

Actively managing invasive vegetative species with IPM treatment practices, standard operating procedures, and BMPs, including early spring grazing and prescribed fire, could benefit fire suppression efforts by reducing fuel load and the rate of spread in the event of wildfire.

For vegetation treatments, see text above under Fire Management and Ecology.

Transportation and Access: The potential for fire ignitions from cross-country travel with vehicles would be the highest as this alternative allows for cross-country vehicle travel for game retrieval and camping for a distance of 300 feet.

Visual Resources: Alternative B has a few more acres designated in VRM Class II than Alternative A. The difference in acreage between Alternatives A and B would not create further impacts. There still could be some minor constraints in meeting landscape level treatment objectives. Any vegetation treatments would have a short-term effect on visual resources but the long-term benefits of the treatments would far outweigh the smaller short-term effects.

Livestock Grazing: Within the Exemption Area, an increase of AUMs and acres capable for cattle grazing could reduce fire behavior and intensity of wildfires by reducing the amount of fine fuels available to burn.

Within the Fort Meade ACEC, extending the grazing period from October 15 to October 31 could limit the number of acres and days that are available to utilize prescribed fire as a treatment tool.

Impacts under Alternative C

Fire Management and Ecology: Forest and rangeland vegetation treatments would average about 850 acres per year, where 350 acres would be treated mechanically and about 500 acres would be treated with prescribed fire. For the 20-year life of the RMP, the total acres treated would be about 17,000 acres, or about 6 percent of BLM-administered lands within the planning area.

Fewer acres and opportunities to implement landscape level treatments would be available than in Alternative B. Buildup of fuels could contribute to the effect of creating large, high intensity wildfire. Measures that would be required for project planning and implementation of treatments would reduce the effectiveness for reducing hazardous fuels or improving wildlife habitat, which could cause competition for resources and increase the stress to vegetation across the landscape. Fire is an important part of the ecosystem and could be used to restore habitats back to native components if applied during the appropriate season. The opportunities to improve landscape health and condition classes; reduce the chances of wildfire degradation of key ecosystem components, native species, watersheds, and streams on a landscape level would be greater than Alternative A but less than Alternative B.

Forest and Woodland Products: Rest periods from livestock grazing up to one year prior to treatment and up to two growing seasons following treatments could be used to promote vegetation recovery and would benefit fire and fuels management. Adaptive management at the project level could allow grazing prior to recommended rest periods when an interdisciplinary team determines this action is needed. For forest health treatments, see text above under Fire Management and Ecology.

Special Status Species: Prescribed burning would not be allowed in Greater Sage-Grouse PPAs. This could limit the flexibility for designing, planning, and implementing fuels projects in these areas. Fewer acres (96,379 acres) would be available to meet landscape level objectives that could benefit multiple resources including fire management. Buried power lines, which would reduce effects to sage-grouse and sagebrush habitats, would also benefit fire management activities by reducing hazards during fire and fuels activities.

Vegetative Communities: For vegetation treatments, see text above under Fire Management and Ecology.

Transportation and Access: No new permanent road construction would be allowed for forestry/fuels treatments. This could limit the flexibility when designing, planning, and implementing forest health and fuels reduction projects. This reduces the potential for access opportunities for all fire management activities including wildfire suppression. The risk of fire ignition from vehicles during hunting season would be minimal as cross-country travel to retrieve big game animals would be prohibited. Under Alternative C, the risk of fire ignitions from vehicles traveling cross country to camp would be slightly less as the distance allowed for cross-country travel to a campsite would be 100 feet instead of the 300 feet allowance in Alternatives A and B.

Visual Resources: For vegetation treatments, this alternative has the most potential constraint because there are more acres designated in VRM Class II than in Alternatives A and B. This could limit the effectiveness and flexibility for designing, planning, and implementation of fuels projects on those acres. Any vegetation treatments would have a short-term effect on visual resources but the long-term benefits of the treatments far outweigh the smaller short-term effects.

Impacts under Alternative D (Preferred Alternative)

Fire Management and Ecology: Forest and rangeland vegetation treatments would average about 1,400 acres per year, where 400 acres would be treated mechanically and about 1,000 acres would be treated with prescribed fire. For the 20-year life of the RMP, the total acres treated would be about 28,000 acres, or about 10 percent of BLM-administered lands in the planning area.

This alternative would provide good opportunity to expand mechanical and prescribed fire treatments throughout the planning area. Acres treated would continue to target developed areas, but would also target more remote areas to improve forest/rangeland health and improve or protect other resources. During the life of the RMP, progress could be made toward restoring landscape forest health, fire regimes, and improving and/or maintaining condition class, as 28,000 acres would be treated across the planning area.

As in Alternative B, this alternative provides the greatest opportunity to reduce the risk of crown fire and insect outbreaks, restore and/or improve watershed function and condition, increase biological diversity, and improve ecosystem functionality/resilience and health at a landscape level. Developing and implementing treatments on a landscape approach would be the most beneficial and logical approach because fire is a spatial process whose spread and severity is strongly influenced by a variety of landscape features. This alternative would provide the greatest protection and mitigation direction for fire, wildlife, aquatic, watershed, and cultural resources while improving or maintaining the greatest number of acres that are in condition class 2 or 3. The ability to treat the greatest number of acres across the landscape would provide the greatest benefit to the multitude of resources that are present within the planning area.

Forest and Woodland Products: For forest health treatments, see text above under Fire Management and Ecology.

OHV and Travel Management Areas: The risk of fire ignition from vehicles during hunting season would be minimal as cross-country travel to retrieve big game animals would be prohibited. The risk of fire starts from cross-country vehicle travel to campsites would be the same as Alternative C.

Recreation: Managing the Fort Meade ACEC and Exemption Area as a SRMA would likely not affect forest health and hazardous fuels treatments.

Special Status Species: Prescribed burning would be allowed in Greater Sage-Grouse PPAs if the activity would benefit sagebrush communities. This would allow greater flexibility and opportunities to meet multiple fire management and other resource objectives throughout the planning area. Buried power lines, which would reduce effects to sage-grouse and sagebrush habitats, would also benefit fire management activities by reducing hazards during fire and fuels activities.

Vegetative Communities: Rest periods from livestock grazing up to one year prior to treatment and up to one growing season following treatments could be used to promote vegetation recovery and would benefit fire and fuels management. Adaptive management at the project level could allow grazing prior to recommended rest periods when an interdisciplinary team determines this action is needed.

In addition to watershed, grazing management, and wildlife objectives, land treatments would be used to achieve, maintain, and/or improve fire regimes and condition classes which specifically benefits fire and fuels management.

Actively managing invasive vegetative species with IPM treatment practices, standard operating procedures, and BMPs, including early spring grazing and prescribed fire, could benefit fire suppression efforts by reducing fuel load and the rate of spread in the event of wildfire.

For vegetation treatments, see text above under Fire Management and Ecology.

Transportation and Access: New permanent road construction would be allowed. New roads or increased maintenance of existing roads would improve access for fire suppression and fuels management activities and would create barriers to fire spread, especially in grass/shrubland areas. Road construction could potentially cause some delays when implementing forest health and fuels reduction activities. More opportunities would exist for human-caused fire ignitions.

Visual Resources: For vegetation treatments, this alternative has less potential constraint than Alternative C. This Alternative has a few more acres designated in VRM Class II than Alternative A. The difference in acreage between Alternatives A and D (approximately 320 acres) would not create further impacts. There still could be some minor constraints in meeting landscape level treatment objectives. Any vegetation treatments would have a short-term effect on visual resources but the long-term benefits of the treatments far outweigh the smaller short term effects.

Livestock Grazing: Within the Exemption Area, an increase of AUMs and acres capable for cattle grazing could reduce fire behavior and intensity of wildfires by reducing the amount of fine fuels available to burn.

Within the Fort Meade ACEC, extending the grazing period from October 15 to October 31 could limit the number of acres and days that are available to utilize prescribed fire as a treatment tool.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

The effects of climate change are uncertain, but are estimated to create warmer, dryer conditions. This would likely cause fire seasons to be longer with the potential for more acres to burn in a season (Fire Science Digest 2007). Severe weather or drought can create extreme fire conditions and high severity fire effects in flammable vegetation. It is possible that this could occur in both treated and untreated areas, but in most cases treatments would lessen undesirable wildfire effects.

Coordinated fuel reduction treatments by other agencies and private landowners on lands adjacent to BLM-administered lands generally results in a beneficial cumulative impact at a large scale.

Cumulative Impacts under Alternative A (Current Management)

Under Alternative A, developed areas such as urban interface or rural intermix would likely have received hazardous fuels reduction treatments at least once during the life of the plan. Some areas may have been treated twice, or would be due for re-entry. This would create favorable conditions for fire suppression actions, which would increase the likelihood of early success at fire containment; or would increase the chances of saving more structures.

At the landscape level, Alternative A treatments would not be keeping pace with vegetation growth/disturbance cycles. The reduced treatments of Alternative A could exacerbate or expand poor forest/rangeland health conditions. Compared to the other alternatives, at the end of the life of this plan there would be more areas with heavy fuel loads, which could increase the chances of extreme fire behavior, larger fire sizes, and the potential for large-scale undesirable fire effects.

Cumulative Impacts under Alternative B

Treatments would target about 10 percent of the BLM landscape during the life of the RMP. Improvements or maintenance of vegetation that contributed to a reduction of hazardous fuels on the landscape would benefit the fire management program through reduced risk to firefighters and the public. Reducing the volume of burnable biomass and vegetation on the landscape would contribute to reducing wildfire severity, intensity, fire behavior, and the effects that wildfire would have on other resources. Any reduction in burnable vegetation would provide less risk and greater success in suppression of wildfires. Cost of wildfire suppression would be lowered as vegetation and biomass continued to be reduced through various treatment methods. Less rehabilitation of the landscape as a result of the removal of fuels and biomass would occur.

Opportunities to improve and/or maintain fire regime condition class would increase because of the increased number of acres treated across the landscape. Improving and/or maintaining these acres would benefit not only the fire management program, but other resources as well. The overall health, sustainability, and biological diversity of the landscape would be enhanced.

Cumulative Impacts under Alternative C

Potential cumulative impacts are similar to Alternative A with the addition of a few more restrictions and limitations that would affect not only fuels management activities but also could affect wildfire suppression activities.

Limiting or prohibiting vegetative treatment activities within the planning area would result in changes to key ecosystem components, such as vegetation characteristics, fuel composition, and fire frequency, severity, and pattern. Fewer opportunities would be available to improve and maintain ecosystem functionality at a landscape level than in Alternative B. Buildup of fuels would contribute to the effect of creating large, high intensity wildfires.

Fewer opportunities to improve fire regime condition at the landscape level would be available because of potential limitations for planning, designing, and implementing vegetative treatments at the landscape level.

Cumulative Impacts under Alternative D (Preferred Alternative)

Treatments would target about 10 percent of the BLM landscape during the life of the RMP. Improvements or maintenance of vegetation that contributed to a reduction of hazardous fuels on the landscape would benefit the fire management program through reduced risk to firefighters and the public. Reducing the volume of burnable biomass and vegetation on the landscape would contribute to reducing wildfire severity, intensity, fire behavior, and the effects that wildfire would have on other resources. Any reduction in burnable vegetation would provide less risk and greater success in suppression of wildfires. Cost of wildfire suppression would be lowered as vegetation and biomass continued to be reduced through various treatment methods. Less rehabilitation of the landscape as a result of the removal of fuels and biomass would occur.

Opportunities to improve and/or maintain fire regime condition class would be increased because of the increased number of acres treated across the landscape. Improving and/or maintaining these acres would benefit not only the fire management program, but other resources as well. The overall health, sustainability, and biological diversity of the landscape would be enhanced. The protection of the ecological, social, and economic values ascribed in the planning area that both directly and indirectly affect the services and products these ecosystems provide to the residents of South Dakota would receive the greatest amount of protection. This includes clean water, timber, and recreation opportunities.

Impacts to Resource Uses from the Alternatives

Forest and Woodland Products

This section describes the impacts each alternative has on the use of forest and woodland products in terms of direct, indirect, short-term, and long-term impacts, and the intensity or degree of these impacts. The term “forest” will include woodlands. As appropriate, impacts are described as beneficial or adverse with respect to forest products.

Actions within each alternative could affect forest products resource use. Actions (or inaction) that restrict the availability, quality, and quantity of forest products are considered adverse impacts. Conversely, beneficial impacts include actions that improve health and, therefore, long-term availability and provide a variety of forest products in the planning area. Indirect impacts on availability of forest products may include changes in forest species, vigor, health, site quality, and vegetative community type as a result of natural forces (insect and disease, fire, and drought conditions), management actions from other resources, or failure to implement management actions.

Forest species within the planning area are, for the most part, fire dependent. These forests naturally maintained themselves through frequent, low severity fires. Much of the forest within the planning area has not seen a natural fire event in several decades. Only recently has there been any attempt at prescribed fire and mechanical treatments that mimic natural events. Sale of forest products increases the likelihood and effectiveness of forest treatments. Inaction (or reduced action) would add to the adverse impact of overstocked and undesirable forest conditions.

Assumptions

Assumptions used in this analysis include the following:

A healthy forest is more stable and resilient to wildfires and insect and disease epidemics.

The need to manage forests would increase to accommodate other multiple uses.

Forest health objectives (including restoration and hazardous fuels reduction) would be the major determining factor in forest management activities.

The sale of forest products increases the likelihood of forest management being accomplished, due to funding considerations.

The contribution of BLM-managed lands to old growth landscapes is very limited due to the fragmented ownership pattern. Old growth characteristics would be analyzed and managed at the project level. Consideration for old growth would follow the Healthy Forests Restoration Act of 2003, Section 102, for maintaining and managing these characteristics

The sale of minor amounts of personal use wood products such as Christmas trees, fuelwood and post/poles would have no appreciable effect on the overall forest resource.

Natural processes such as insect and disease infestations would continue to contribute to loss of forest products within the forested resource.

Limited access to some isolated parcels restricts the ability to manage forested lands on a long-term basis.

Impacts Common to All Alternatives

No sale of forest products would be allowed on the Fossil Cycad ACEC, so there would be no contribution from these 320 acres to providing forest products.

Any of the alternatives may have site-specific and/or timing constraints for implementing vegetation treatments because of sensitive resources. Some examples include highly erodible soils, critical/core wildlife habitat, invasive species, recreation events, and paleontological and cultural resources. For any forest product sale activity, interdisciplinary planning would identify mitigation measures or constraints necessary for successful implementation.

The management common to all alternative requires that a minimum of two existing snags per acre greater than 16 inches diameter at breast height (DBH) and 30 feet tall would apply. Beyond this there would be no specific management direction on the use (sale) of snag and cavity bearing trees on the planning area, except that on the Fort Meade ACEC salvage of dead trees in groups of 10 or more would be allowed. Dead trees in excess of the minimums may be available for sale, and contribute to the forest product volume. While it is not anticipated that the dead tree amount would be significant, catastrophic events can happen and the ability to sell this volume may aid management in responding to these events. No management action is proposed for making snags if they are not sufficiently present.

Potential impacts from the sale of forest products would be similar under all alternatives. The level of likely sale varies only slightly among alternatives, so the variation in impacts is also slight. Volume per acre would likely decrease across all alternatives compared to recent past harvests, as reentry harvests are estimated to be lighter removals than initial entry. The resources initiating a forest management project, usually fire management or wildlife habitat management,

would indicate the types and areas of treatment, as well as intended outcomes. The availability of product sale improves likelihood of treatment. Treatments, rather than the sale of the residual product, may result in impacts. Impacts common to all alternatives from the sale of forest products include increased traffic and noise while the harvest is ongoing. Traffic and noise effects are temporary, usually only lasting one to two operating seasons on an intermittent basis. The re-entry cycle would be approximately 20 years. The sale of a product makes treatment more economically feasible and, therefore, more likely to happen.

Under any alternative, if a net reduction of forest land from public ownership results from sales or exchanges, adverse impacts would be dependent on the amount of reduction. The loss of forest product sales from SDFO would have little impact on the BLM's total forestry program, but may impact local availability of forest products. Land use changes through Recreation & Public Purpose (lease) actions would have an insignificant impact on the forestry resource due to the small acreages involved.

Potential impacts on visual resources would be negligible under all alternatives. Forest product sale associated features, such as landings, skid trails, and roads would be designed to minimize visual impacts.

Impacts under Alternative A (Current Management)

Forest and Woodland Products: Estimated probable sale quantity would be approximately 7,000 tons/year for all forest and woodland products. Market conditions have shown wide fluctuations in the recent past, so it is not guaranteed the products available would sell.

Travel Management: Roads would be constructed to the minimum standard necessary to remove forest products, unless roads would be needed for other purposes requiring a higher standard. It is probable that new roads would be needed to access available forest products, although given the current road density most of the new roads would likely be temporary rather than permanent. Alternative A leaves the most discretion in building and retention or decommissioning of roads on a project-level basis.

Impacts under Alternative B

Forest and Woodland Products: The estimated probable sale quantity would be approximately 7,000 tons/year for all forest and woodland products. Market conditions have shown wide fluctuations in the recent past, so sale of available products is not guaranteed.

Travel Management: This alternative specifies that new roads may be built for long-term management of areas where multiple entries are anticipated. Road construction would be kept to the minimum necessary for multiple use management. Rerouting, maintenance, decommissioning, and temporary roads would be authorized. Road decommissioning would be included in any project where required and not as a separate project. It is likely that new roads would be built to access additional areas, increasing the likelihood of forest product sales.

Wildlife Habitat: Alternative B specifically allows for the salvage of snag and cavity bearing trees, while retaining the minimum necessary under all management. Roads would be built to access salvageable trees. This alternative provides the highest likelihood of forest products being available for salvage. Fort Meade ACEC direction allows dead trees in groups of 10 or more to be salvaged. While it is not anticipated that dead tree amounts would be significant, catastrophic events can happen and the ability to sell this volume, with increased access by building new roads, may aid management in responding to these events.

Impacts under Alternative C

Forest and Woodland Products: The estimated probable sale quantity would be approximately 6,000 tons/year for all forest and woodland products. It is assumed volume would be decreased as road access is limited under this alternative. Market conditions have shown wide fluctuations in the recent past, so it is uncertain whether the products available would sell.

Travel Management: No new permanent roads for forest product removal would be constructed under this alternative. Rerouting of existing roads would be prohibited, and maintenance of existing roads would be allowed. Temporary road construction would be allowed, kept to the minimum necessary to remove product, and decommissioned as part of a project (not as a separate project). This alternative is the most restrictive in terms of providing access to salable forest products. As such, is anticipated the volume available for sale would be less than the other alternatives.

Wildlife Habitat: While retaining the minimum identified for all management actions, this alternative allows for the salvage of snag and cavity bearing trees where public safety has been identified as a potential concern and where no new permanent roads would be authorized. Temporary roads would be used to access salvageable trees and then decommissioned as part of the project. Fort Meade ACEC direction allows dead trees in groups of 10 or more to be salvaged. Although it is not anticipated that dead tree amounts would be significant, it is likely that catastrophic events would happen in the future. Alternative C would provide the least forest product availability from salvage opportunities.

Impacts under Alternative D (Preferred Alternative)

Forest and Woodland Products: The estimated probable sale quantity would be approximately 7,000 tons/year for all forest and woodland products. Market conditions have shown wide fluctuations in the recent past, so sale of available products is not guaranteed.

Travel Management: This alternative specifies that new roads may be built for long-term management of areas where multiple entries are anticipated. Road construction would be kept to the minimum necessary for multiple use management. Rerouting and maintenance are specifically authorized, and temporary roads are authorized with decommissioning to be part of the project. It is likely that new roads would be built to access additional areas and increase the likelihood of forest product sales.

Wildlife Habitat: This alternative specifically allows for the salvage of snag and cavity bearing trees, while retaining the minimum necessary under all management. Roads could be built to access salvageable trees. This alternative provides the highest likelihood of forest products being available for salvage. Fort Meade ACEC direction allows dead trees in groups of 10 or more to be salvaged. While it is not anticipated that dead tree amounts would be significant, catastrophic events can happen and the ability to sell this volume, with increased access by building new roads, may aid management in responding to these events.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Cumulative impacts include availability of forest products for personal use and commercial sales. Although the volume from the BLM lands is negligible compared to volumes from the adjacent Black Hills National Forest, the timing and accessibility of volume may provide a critical bridge in maintaining production. The Black Hills National Forest has shut down sales for planning purposes, funding considerations, and temporary resource concerns (spring breakup) in the past. An alternate source of volume would provide security and flexibility for commercial as well as personal use. The availability of treatment options for reducing Mountain Pine Beetle risk, as well as for other forest health concerns is vital to the BLM's stewardship responsibilities.

Cumulative Impacts under Alternatives A (Current Management), B, and D (Preferred Alternative)

The cumulative impacts of the alternatives are similar (impacts common to all alternatives), except for differences in road decisions. Alternatives A, B, and D allow for the building, use, and maintenance of access to remove forest products, including dead and salvage material. The sale of timber provides a funding and mechanical source to maintain or close roads in forested areas. These are the most advantageous alternatives for forest product sale and removal.

Cumulative Impacts under Alternative C

Forest and Woodland Products: Alternative C would allow less access to forest products and increased costs for vegetation treatments and removal of forest products. The cumulative impact would be moderate over the long-term.

Livestock Grazing

This section describes potential impacts to livestock grazing resulting from implementation of management actions for other resource programs. Impacts to livestock grazing activities are generally the result of activities that affect forage levels, land use restrictions that affect the ability to construct range improvements, and human disturbance/ harassment of livestock within grazing allotments.

Activities that result in surface disturbance (mineral development, ROW construction, recreation) or management of resources that result in limiting surface disturbance (fish and wildlife, vegetation, water resources, soil resources, and visual resources) also would impact livestock grazing by affecting forage levels. Management of fire and forest and woodland products would affect livestock grazing by either preserving or increasing available forage for livestock over the long term. Refer to Maps 2-11 through 2-14 for grazing allotment maps and Map 2-24 for the Exemption Area grazing capability map.

Assumptions

Allowable uses and management actions limiting, reducing, or prohibiting livestock grazing or AUMs in the planning area are considered adverse impacts. Deterioration in rangeland health is also considered adverse to livestock grazing. For example, restrictions on livestock grazing or AUMs from other resources are considered adverse impacts. Conversely, beneficial impacts to livestock grazing include those allowable uses or actions that improve rangeland health, increase AUMs, or decrease restrictions and costs to graze livestock. Direct impacts to livestock grazing result from actions that change AUM allocations, rangeland health, or restrict livestock grazing. Indirect impacts result from actions that alter livestock grazing management on BLM land within the planning area. For the purpose of this analysis, short-term impacts include activities that affect livestock grazing within five years of when the activity occurs. Long-term impacts are those remaining or occurring after five years.

Cattle Grazing on Public Land in Meade County, South Dakota BLM Photo

Assumptions used in development of this analysis include the following:

For Alternatives B and D, AUM calculations assume that all grazing allotments would have improved range conditions that would lead to the allowed five percent increase in permitted AUMs. All allotments would still be required to meet Standards for Rangeland Health. It is also assumed that all capable acres and associated AUMs within the Exemption Area would be permitted under grazing leases.

Livestock grazing causes minimal small-scale surface disturbance when properly managed.

Range improvement projects would continue to be used to achieve rangeland management goals.

Livestock grazing allocations would not change because of ACEC or SRMA designations.

Ten percent of all grazing permits/leases would be renewed each year on a 10-year cycle.

Based on a three-year average from 2007 through 2009, 22 permits/leases would be transferred annually.

Range improvement projects funded by the BLM each year average 2.7 miles of fence and 557 feet of pipeline. An average of one pit/reservoir is funded by the BLM every two years. Improvement projects funded by livestock operators or NRCS annually on public lands are likely to include two miles of fence and one mile of pipeline on BLM land. It is assumed that these improvements would result in acres of disturbance pre and post reclamation that are shown in Table 4-43.

Table 4-43
Range Improvement Projects
(Average Acres Disturbed per Project)

Pre-Reclamation	***Post-Reclamation***
1.0 acre per pit	0.3 acre per pit
1.7 acres per mile of pipeline	0.12 acres per mile of pipeline
1.2 acres per mile of fence	0.007 acres per mile of fence

The Decision Area averages 3.7 acres/AUM of forage for livestock.

Impact analyses and conclusions are based on interdisciplinary team knowledge of rangeland resources within the planning area, existing rangeland health and range monitoring data, reviews of existing literature, the BLM Rangeland Administration System, and information provided by other agencies. Effects are quantified where possible. In the absence of quantitative data, best professional judgment was used. Impacts are sometimes described using ranges of potential impacts or in qualitative terms if appropriate.

Impacts Common to All Alternatives

Under all alternatives, vegetation allocation and use levels would be adjusted, if necessary, to meet Standards for Rangeland Health (Appendix A) which would impact grazing operations and operators. Achievement of Standards would provide a stable amount of forage available for livestock grazing during the planning period. The BLM would complete assessments for rangeland health on a priority allotment basis with emphasis on allotments with significant public land acreage, special status species, and resource problems or issues (I and M category allotments).

If livestock grazing is preventing achievement of the Standards and Guidelines, specific direction to the permittee/lessee would be identified on the lease terms and conditions. However, if Standards are not being met due to conditions unrelated to livestock grazing, grazing management terms and conditions might be left intact. Site-specific lease terms and conditions are determined by an interdisciplinary team in consultation with lessees and interested publics for each individual allotment.

Management actions would be designed to maintain or improve vegetation conditions and would include grazing use, grazing activity plans and systems, range improvements, and vegetation treatments. Drought, fire, flood, and insect infestations would reduce available forage from site-specific areas; livestock grazing use adjustments may be necessary to ensure rangeland health damage does not occur. Affected grazing operations would need to find additional forage or reduce numbers, depending on the specific situation.

Achieving or maintaining Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997a) are generally effective in managing potential adverse effects to other resources from livestock grazing. Adjustments to grazing authorizations are made on a case-by-case basis when site-specific studies indicate changes in management are needed. However, according to BLM rangeland health assessments completed since 2004, approximately 4,500 acres of the 260,000 acres assessed within the planning area did not meet Standards for Rangeland Health as a result of livestock grazing (BLM 2010a). Corrective management actions have been implemented on all grazing allotments that did not meet the Standards. 3,100 acres of allotments which did not meet the Standards were assessed during the lease renewal process to ensure allotments continue meeting Standards, leaving 1,400 acres still not meeting Standards due to livestock grazing. Additional monitoring will be conducted on these allotments to ensure significant progress toward meeting the Standards.

As part of project planning, reclamation plans including weed management prescriptions would provide guidance to best reclaim each site for vegetative recovery and long-term sustainability. The use of fertilizer on public lands to accomplish natural vegetation community restoration would provide nutrients to boost native growth where nutrients are found to be limited on a given site. Aside from surface disturbance impacts, indirect impacts of these actions would be expected to change livestock grazing patterns and distribution within allotments.

Rangeland improvement projects allow permittees/lessees to better implement grazing management practices and manage distribution and movement of livestock within allotments. The priority for funding and implementing range improvements differs among alternatives, where Alternative B emphasizes livestock production and Alternative C emphasizes watershed protection. The anticipated number of improvements would stay the same among alternatives as the number of range improvements is closely tied to BLM funding each year and NRCS environmental contracts.

Range improvement projects would cause eight acres of annual surface disturbance pre-reclamation. These acres would be reduced to 0.3 acres post-reclamation. All reclamation should be completed in the short term. Impacts to livestock grazing are, therefore, negligible among alternatives.

Project design would consider special design features to minimize impacts to other resources. Fence construction in compliance with BLM Fencing Manual Handbook H-1741-1 and the WO IM-2010-022 (Managing Structures for the Safety of Sage-grouse, Sharp-tailed grouse, and Lesser Prairie-chicken) would ensure wildlife-friendly construction and acceptable construction standards. Livestock containment or wildlife exclusion objectives may not be achieved with strict adherence to the standards in some situations, however, making it necessary to deviate from the standards. Authorized deviations would also consider wildlife needs, and implementation of special design features would add cost to a project.

Livestock Grazing: Livestock grazing would continue to occur within the majority of the planning area under all alternatives. The Dakotas section of the publication Montana/Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management (Appendix A) would be applied, regardless of alternative. Vegetation treatment projects designed to benefit rangeland health also are anticipated to occur under all alternatives. Prescribed burning is anticipated to be a higher priority over the life of the RMP than it has been in the past.

Rangeland improvement projects such as fencing and water development also occur under all alternatives. Impacts associated with fencing and water pipelines are considered to be short-term, and typically regeneration occurs within two to three growing seasons. While impacts associated with construction of these facilities are short-term, the indirect impacts of these actions can be long-term. For example, new fences and new water developments are expected to change livestock grazing patterns and distribution within the allotment.

Congregation of livestock and wildlife around a water source and trailing patterns also are expected to change as a result of constructing these facilities. Overall, long-term impacts from these facilitates are anticipated to have a beneficial

improvement to rangeland health. Rangeland improvement projects allow livestock managers and lessees to better implement grazing management practices and manage distribution and movement of livestock within allotments.

Livestock grazing within the Fort Meade ACEC would continue under a vegetative grazing use contract through a bidding process. There would be no impacts to livestock grazing from this action.

Any changes in AUM allocations would be handled through the watershed planning process or on an individual allotment basis and may occur for several reasons, but generally would be limited to specific allotments. Any potential changes to AUM allocations would be based on the amount of available forage in an allotment as determined through inventory and monitoring. The number of AUMs permitted in an allotment may be adjusted permanently or placed into suspended use for the short term (three to five years). Changes in AUM allocations have more impact on individual allotments and lessees than they do to AUM allocations in the entire planning area.

Climate: Potential changes in climate that affect temperature and precipitation would affect plant communities and livestock grazing. Changes to seasonal weather patterns, ambient air temperatures, carbon levels, and the timing and amount of precipitation could result in direct, long-term impacts to many native plant communities. Since the specific type or degree of change to climatic conditions is not fully understood at this time, determining impacts to livestock grazing over the next 20 years is difficult.

Recent research in the northern Great Plains indicates net reductions of greenhouse gas emissions on native range pastures can be most effectively achieved through moderate stocking rates (Liebeg, et al. 2010). This research underscored the value of moderately grazed native rangeland in the northern Great Plains to serve as a net CO2 sink, especially in comparison to heavily grazed pastures.

Livestock grazing may be affected if summer temperatures rise significantly and create drier conditions where pasture yields decline and livestock tend to gain less weight (USEPA 1998). An increase in the vulnerability to pests, invasive species and a loss of native species is likely to occur through a combination of climate change and human-induced stresses (Karl, et al. 2009). Adaptation to changing conditions through adaptive management practices would provide the best means to reduce adverse impacts to grazing.

Cultural Resources: Managing cultural resources can restrict the location and design of rangeland improvement projects and consequently grazing systems. For example, avoidance of cultural resource sites may limit the BLM's ability to construct rangeland improvement projects in an allotment aimed at better management of livestock. In addition, cultural resource management can delay construction of range improvement projects by requiring additional surveys and design changes to avoid cultural sites. Impacts to livestock grazing would be minor for individual allotments and negligible throughout the planning area.

Fire Management and Ecology: Fire can have both beneficial and adverse impacts to livestock grazing. In the short term, fire reduces forage that sustains livestock and can damage facilities such as fences. This damage can have a substantial adverse economic impact on grazing operations by requiring leasing of additional pasture, feeding livestock for longer periods of time, repairing or building more fences, and reducing herd size. In the long term, fire may improve the quality and quantity of forage, thereby improving flexibility in managing livestock.

Both wildfire and prescribed fires can increase the extent of invasive plant species found on an allotment. The extent that fire degrades rangeland health through propagation of invasive plant species typically depends on the proximity to a source of invasive plant species seed, the type of vegetation community burned, and fire severity. Fire management using prescribed fire can benefit livestock grazing by improving the quality, quantity, and availability of forage for livestock. Prescribed fire also can help meet specific management objectives, such as improving distribution of livestock or removing dense stands of brush. Fire suppression activities can limit the loss of livestock; short-term loss of forage, and in some cases, the long-term damage to vegetation caused by fire. It can also increase the likelihood of invasive plant species introduction and/or spread into an allotment. The long-term impact of repeated fire suppression is the buildup of hazardous fuels and the increased risk of severe wildfire.

In burned areas erosion would be mitigated at sites where sedimentation impacts to adjacent streams are likely. Mitigation could include a temporary reduction or removal of livestock from the given pasture/area to ensure livestock grazing is not impacting erosion. Impact to livestock grazing throughout the planning area would be negligible.

Fluid Minerals: Mineral development on BLM land can result in direct removal of forage available to livestock. Rangeland health and forage production can be indirectly affected by mineral development through the introduction and spread of invasive plant species and soil loss. Both direct and indirect impacts of mineral development are associated with surface disturbance caused by constructing road networks; drilling; installing well pads, pumps, pipelines, and water detention facilities; constructing other associated infrastructure; and ongoing maintenance. When compared to other minerals, oil and gas development and bentonite production are anticipated to cause the most surface disturbance and hence, the most adverse impact on livestock grazing in the planning area.

Of a total of 504 allotments administered by the SDFO, 63 allotments are in areas considered to have a high to moderate potential for oil and gas development. All or portions of these allotments would likely be affected by oil and gas development. Both short and long-term impacts to AUM allocations may occur, where long-term impacts are of greater concern to livestock grazing. The degree of impact would depend on the rate of development, production success, and how quickly disturbed areas are reclaimed. For example, it is expected that disturbed areas associated with non-producing wells would be reclaimed fairly quickly and AUMs taken out of production restored. This would be considered a short-term impact.

On the other hand, for producing wells, it may take many years before disturbed areas are reclaimed and made available for grazing, thus creating a long-term impact. Reducing AUMs would be local in nature since development is unlikely to occur simultaneously across the entire area (all wells developed at the same time). The impact on AUM allocations would be moderate for individual allotments, with the overall impact of disturbance from oil and gas development on AUMs in the planning area expected to be minor.

Forest and Woodland Products: Silvicultural practices used to reduce hazardous fuels or meet other resource objectives would improve the quantity of forage (Moore, et al. 2006) and provide additional foraging opportunities through varied forage quality (Long, et al. 2008), thereby improving flexibility in managing livestock. The number of grazing allotments in forest and woodland areas is limited throughout the planning area; therefore impacts to livestock grazing would be negligible.

Lands and Realty: Land disposal could occur throughout the planning area. The majority of land disposed would likely continue to be grazed under different (private) ownership; however, grazing fees would no longer be collected by the BLM for these areas. Land disposal is frequently tied to land exchanges, resulting in no net change in AUMs or only a slight increase or decrease in AUMs. Land exchanges between the BLM and private entities typically result in the BLM acquiring fewer acres of higher overall quality than the acreage disposed, resulting in a reduction in acreage managed by the BLM. However, the impact on overall AUMs in the planning area cannot be predicted due to the differences in forage production among sites.

In addition, the SDFO targets lands for acquisition that helps consolidate BLM land into larger blocks making management more efficient. Therefore, land disposal and acquisition may or may not occur in the same allotment. Consequently, land exchange frequently has a more dramatic impact on specific allotments than on the total number of AUMs in the planning area.

Subdividing base property for recreation or housing developments could potentially impact the BLM's ability to effectively manage adjacent BLM land for grazing. Requests to divide or combine allotments would be denied when it does not result in proper and efficient management of public rangelands (43 CFR 4110.2-4). Subdividing would primarily impact individual grazing allotments and could result in breaking allotments into smaller units or in canceling the grazing lease entirely. In addition to structures, subdivisions generally result in more roads, fences, power lines, and other facilities – all of which can fragment habitat and increase the opportunity for introduction or spread of invasive plant species. The long-term impact could result in loss of AUMs and degradation of rangeland health.

Locatable Minerals: Bentonite mining is anticipated to cause surface disturbance similar to oil and gas development. Of a total of 504 allotments administered by the SDFO, 22 allotments are in areas considered to have a potential for bentonite production. All or portions of these allotments would likely be affected by bentonite production. Impacts to AUM allocations could occur and would be similar to impacts from oil and gas.

Areas under bentonite mining would generally be reclaimed before moving on to the next area. This would create less surface disturbance than oil and gas at any given time. The impact on authorized AUM allocations could be substantial

for individual allotments, but the overall impact of disturbance from bentonite production on AUMs in the planning area is expected to be minor.

Noxious Weeds and Other Invasive Species: One of the primary indirect impacts of surface disturbance affecting rangeland health and productivity is the introduction and spread of invasive plant species. Invasive plant species displace native vegetation and, because they typically are unpalatable to livestock and wildlife, remain ungrazed. This places more strain on remaining native vegetation to support grazers, giving invasive plant species an additional advantage over native vegetation in their competition for water, nutrients, and light. Invasion of some weed species (cheatgrass) can alter the fire regime of an area, causing long-term adverse impacts to livestock grazing. Surface-disturbing activities typically include mechanized or mechanical disturbance, such as construction of well pads, roads, pits, reservoirs, pipelines, and power lines; mining; and vegetation treatments. Although typically reclaimed, these activities can increase invasive plant species infestations and soil erosion within allotments in both the short and long term. Land reclaimed from oil and gas or other activities generally has a short-term beneficial impact on rangeland productivity due to reseeding and subsequent growth of native grasses.

Travel Management: Changes to OHV use and travel management areas would not affect livestock grazing as lessees would continue to be allowed wheeled cross-country travel for management of their animals and allotment unless specifically precluded in the lease.

Vegetative Communities: Riparian and wetland communities, habitat, and associated uplands would be treated and restored through implementation of livestock grazing guidelines to meet Dakotas Standards for Rangeland Health. Allotments not meeting riparian habitat or water quality Standards due to current livestock grazing management would be required to make management changes to move toward meeting the Standards. Management changes would address the guidelines in the Montana/Dakotas Standards for Rangeland Health and Guidelines for Livestock Grazing Management. Impacts to livestock grazing would be negligible across the planning area with minor impacts to individual allotments.

Wildlife and Special Status Species: Management for plant and wildlife species designated as threatened or endangered under the ESA or considered to be sensitive species by the BLM in the planning area, can affect livestock grazing in allotments where these special status species occur. Specifically, restrictions on the type, location, or time period the activity is allowed could limit livestock management options in allotments where sensitive species occur. For example, managing water developments to reduce the spread of West Nile virus within sage-grouse habitat areas would result in denying some requests for water developments. Stock ponds are the water development least likely to be approved in areas where mosquitoes are likely to breed in and around sage-grouse summer use areas.

In addition, special status species management can increase costs to livestock grazing operations by requiring additional surveys and design changes to projects. In sagebrush habitats where sage-grouse or other sagebrush-dependent species may occur, the placement of range-improvement projects, season of grazing use, level of grazing use, use of prescribed fire, adjustments in grazing preference, and seasonal restrictions all may be affected.

Prairie dogs are another species that may affect livestock grazing. Although the black-tailed prairie dog is not listed as threatened or endangered, it is a BLM sensitive species, an important food source for several raptors, and provides habitat for the burrowing owl and other wildlife species. The agricultural community in the planning area is concerned about large towns of prairie dogs and how they could affect the forage base, as well as how managing these species affects livestock grazing operations.

Removing or modifying existing fences to improve wildlife movement would have a negligible impact on livestock grazing distribution. A majority of fencing issues would result in a fence modification where woven wire is replaced with barbed wire. This would have negligible impact on livestock grazing management. Impacts to livestock grazing would be negligible in situations where fences are relocated to improve wildlife movement (away from sage-grouse leks).

Maintaining 8 to 12 inches of residual herbaceous growth on 50 percent of the uplands within the Fort Meade ACEC needed for nesting by ground nesting birds, particularly sharp-tailed grouse and waterfowl, would have no impact on livestock grazing.

Allotment categorization would use criteria found in Handbook 1740-1 and new criteria outlined in Appendix H. Allotment category designations may be changed as new information from monitoring, land health evaluations, habitat assessments, or sensitive species data becomes available. There would be 324 Custodial (C) category allotments, 21 Improve (I) category allotments, and 159 Maintain (M) category allotments. The 104 allotments that would change from category C allotments to category M allotments are the C category allotments that range in size from 329 acres to 3,557 acres. Allotments would likely remain in these categories unless they are identified as not meeting standards, where they would be changed from category C or M allotments to I allotments. If category I allotments are found to be meeting all standards and no further resource concerns are identified, they would be changed to category M or C allotments according to guidance. Changes in allotment designations would be documented through plan maintenance.

Priority allotments for monitoring and land health evaluations would be allotments that:

- did not meet Standards for Rangeland Health;
- contain special status species habitat; and
- contain "non-functional" or "functioning at risk" downward trend riparian areas.

AUM conversions in kinds of livestock would be considered through project level planning. Such changes would be consistent with wildlife, watershed, riparian, special status species, and vegetation objectives. Any changes in AUM conversions resulting in an authorization to run more or less of a specific class of livestock would directly impact affected allotments; however, it is not expected to affect the overall number of available AUMs.

Grazing within areas of high concentrations of special status plant species may be restricted where adverse impacts to the plant are expected. A reduction of authorized AUMs would be negligible overall, as there are very few special status plants within the planning area. Livestock grazing would continue to be restricted in exclosures at the Fort Meade ACEC unless grazing is needed for fuels management or resource benefits.

Impacts under Alternative A (Current Management)

Available BLM-administered surface for livestock grazing would be approximately 271,000 acres and support an estimated 73,400 AUMs. The current grazing permitted use would be maintained or increased through implementation of Allotment Management Plans (AMPs), range improvements, and vegetation manipulation. AMPs would be developed according to resource conditions and grazing operator cooperation. If these measures fail to provide the permitted use objective while providing for protection of other resource values as established in the plan, livestock reductions may become necessary. Any adjustments in livestock grazing use would be made as a result of monitoring and in consultation with grazing lessees and other interested publics.

Grazing preference and the associated AUMs available for livestock grazing within allotments would remain available for livestock grazing leases where grazing preference is relinquished during the life of the RMP. Alternative A would maintain more available AUMs for livestock grazing compared with Alternative C and fewer available AUMs for livestock grazing compared with Alternatives B and D.

There would be 6,894 and 15,489 acres of Closed and NSO surface disturbance stipulations for oil and gas production (Table 4-30), respectively, for BLM-administered surface lands within Alternative A. There would also be 5,522 acres of ROW exclusion areas (Table 4-31). These acres include all stipulations and consider the overlap of various stipulations as described in the Vegetative Communities section. Surface-disturbing activities would have more of a reduction in forage production and, therefore, more effect on livestock grazing in Alternative A than in Alternatives B, C, and D. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain Standards for Rangeland Health.

Leases are renewed on a case-by-case basis. At the time of renewals, allotments are evaluated with respect to the appropriate management action needed to ensure range condition and objectives were met on I allotments and maintained on M and C allotments. Grazing lease transfers are completed following site-specific interdisciplinary environmental review.

There would continue to be 428 Custodial (C) category allotments, 21 Improve (I) category allotments, and 55 Maintain (M) category allotments. Allotments would likely remain in these categories unless they are identified to be not meeting Standards, where they would be changed from category C or M allotments to I allotments. If category I allotments are found to be meeting all Standards and no further resource concerns are identified, they would be changed to category M or C allotments according to guidance. There would be no year-long leases on M or I allotments. All M or I category allotments would be required to have a grazing season established on the lease that is less than year-long. Grazing lessees of category M and I allotments would be expected to provide actual use grazing reports to the BLM to verify the season grazed is within the grazing season on the lease. Grazing management would not be expected to change unless livestock are grazing outside of permitted use. There would be 104 fewer grazing lessees expected to provide actual use grazing reports in Alternative A than in Alternatives B, C, and D.

Use of yearling factors of 0.7 AU for yearling cattle to establish stocking rate and calculating AUM usage would have no impact on livestock grazing. The 0.7 rate would be used because yearling cattle are smaller and consume less forage. Yearling factors are already in use throughout the planning area, although this procedure has never been standardized which has resulted in a great deal of variability in use.

Livestock grazing within the Exemption Area would be limited to the 1,349 acres and 224 AUMs currently leased. Expansion of grazing onto areas currently not leased for grazing would not be allowed unless tree regeneration is not of importance on BLM-administered land within prospective new allotments. This is less than half the AUMs that would be available to livestock grazing within Alternatives B and D.

Fire Management and Ecology: Livestock grazing would be deferred on a case-by-case basis with lessee cooperation to ensure adequate fuel is present to carry a prescribed fire. An estimated 58 AUMs would become temporarily unavailable for grazing on 213 acres of BLM land treated with prescribed fire annually. Lessees affected by site-specific actions would need to provide alternative food sources for their livestock.

The deferment of livestock grazing after a burn would result in a temporary loss of available forage on the burned acres. Aside from temporary loss of forage, fire can benefit livestock grazing by improving the quality, quantity and availability of forage in the long term. The number of lessees affected by prescribed fire would be less in Alternative A than in Alternatives B, C, and D, as fewer acres would be treated with prescribed fire annually.

Paleontological Resources: The BLM would consider surveys for paleontological resources on a case-by-case basis prior to approval of surface-disturbing activities, but would not require them. Impacts to grazing management would, therefore, be less in Alternative A than in Alternatives B, C, and D, since Alternative C would require field surveys for paleontological resources to be completed for all PFYC three, four, and five geologic formations, and Alternatives B and D would consider surveys for paleontological resources prior to approval of surface-disturbing activities. Impacts to livestock grazing would be negligible.

Vegetative Communities: The number of acres treated through mechanical methods and prescribed fire would be fewer in Alternative A than in Alternatives B, C, and D, with an estimated 559 acres treated per year. Removing overstory vegetation and old decadent growth allows new growth to occur. A short-term increase in forage quantity would be expected (Moore, et al. 2006). Vegetation treatments would maintain forage quantity in the long term in areas that would otherwise have a decrease in forage through encroachment of trees and shrubs. There would be less increase in forage quantity for livestock and wildlife in Alternative A than in Alternatives B, C, and D.

Poisonous plants would not be treated/controlled unless they are designated as noxious. This would minimize opportunities for limiting livestock production and death loss due to poisonous plant ingestion.

Introduced vegetative species are dominant throughout portions of the Fort Meade ACEC. Alternatives A, B, and D would manage the introduced vegetative species while maintaining or improving all rangeland uplands and riparian areas to PFC. Conversion to native species would be limited. The abundance of introduced vegetative species maximizes the AUMs available on the Fort Meade ACEC; therefore, AUMs would be maintained in Alternatives A, B, and D, while Alternative C would slightly reduce AUMs.

Visual Resources: Special design (location, size, and camouflage painting) of semi-permanent and permanent range improvement facilities may be required on 1,231 acres within VRM Class 2, which may increase costs to livestock

grazing operations by requiring additional surveys and design changes to projects. Impacts would be less than Alternatives B, C, and D, where special design may be required within all VRM classes on 274,000 acres of BLM land.

Wildlife and Special Status Species: Three cattle, horse, or bison allotments exist within bighorn sheep range. BLM Instruction Memorandum 98-140 (1998) recommends that domestic sheep would not be permitted within nine miles of bighorn sheep range to protect bighorn sheep. There are 17 cattle, horse or bison allotments within this buffer distance. Currently, there are no domestic sheep and goat allotments within bighorn sheep range or the nine mile buffer, and very few, if any, domestic sheep and goat operations within these areas on private lands. An estimated 1,058 AUMs involving the 17 allotments would be recommended as not available for domestic sheep and goat grazing. They would continue to be available for cattle, horse, or bison grazing. A negligible impact on grazing would result from any of the alternatives related to domestic sheep and goat grazing allotments within bighorn sheep range.

Prairie dog treatment is the least restrictive in Alternatives A, B, and D, with options to treat prairie dogs if they are causing significant adverse impacts to soil and vegetative resources. Therefore, there would be less forage loss in Alternatives A, B, and D due to prairie dog expansion than in Alternative C, where prairie dogs can only be treated for public health and safety concerns.

Limiting livestock grazing on the Fort Meade ACEC from May 15 through October 15 would have a minor impact on livestock grazing on the three allotments within the Fort Meade ACEC compared to Alternatives B and D. The number of livestock would be increased slightly for the shorter grazing season compared to Alternatives B and D to utilize available AUMs on the allotments.

Impacts under Alternative B

Available BLM-administered surface for livestock grazing would be approximately 272,000 acres and support an estimated 77,300 AUMs. Current grazing permitted use would be maintained or increased through implementation of AMPs, range improvements, and vegetation manipulation. AMPs would be developed according to resource conditions and grazing operator cooperation. If these measures fail to provide the permitted use objective while providing for protection of other resource values as established in the RMP, livestock reductions may become necessary. Any adjustments in livestock grazing use would be made as a result of monitoring and in consultation with grazing lessees and other interested people.

Alternatives B and D would maintain the maximum available AUMs for livestock grazing compared with Alternatives A and C. Conversion of native pasture to tame pasture would be allowed to improve, maintain, or protect habitat, sensitive soils, riparian vegetation, or special status plants or animals during vulnerable periods and in cases where alternative forage sources are needed to defer or change livestock grazing patterns to reduce disturbance to wildlife (D'Antonio and Meyerson 2002).

Alternative B would have 6,574 and 105,837 acres of Closed and NSO surface disturbance stipulations for oil and gas production (Table 4-30), respectively for BLM-administered surface lands. There would not be any acres of ROW exclusion areas (Table 4-31) in Alternative B although there would be 189,153 acres of ROW avoidance areas. These acres include all stipulations and consider the overlap of various stipulations as described in the Vegetative Communities section.

These stipulations are applicable to fluid mineral development, renewable energy, and ROWs. Surface-disturbing activities would have less reduction in forage production and, therefore, less effect on livestock grazing than Alternative A, and slightly more of an effect than Alternative C. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain the Standards for Rangeland Health.

Allowable utilization would be limited to 50 percent on all allotments that do not contain approved specific management objectives and established grazing strategies. The thresholds for management changes vary by alternative. Adaptive management within Alternatives B and D provides a framework for monitoring to be carried out before management changes would be implemented. Overall impacts to livestock grazing within the planning area would be negligible with minor impacts to individual allotments.

An estimated 50 grazing leases could be renewed, and 22 leases transferred on category I, M and C allotments each year through preparation of a Documentation of NEPA Adequacy (DNA). Allotment categorization criteria are shown in Appendix H. The screening criteria checklist (Appendix L) would ensure that allotments meet the intent of the previous NEPA document and no new issues have been identified. Impacts to livestock grazing would be negligible.

The estimated two category I allotments within grazing lease renewals and one category I allotment within grazing lease transfers would not likely meet the criteria outlined in Appendix L and would, therefore, require a site-specific interdisciplinary environmental review. An allotment is generally placed in category I when standards are not being met. This would preclude allotments from meeting the criteria outlined in Appendix L. The number of allotments that would, therefore, be renewed and transferred each year by preparing a DNA would be similar to Alternatives C and D and greater than Alternative A.

Yearlong leases on M and I allotments would only be allowed where no resource concerns exist, or when an AMP or terms and conditions on the grazing lease have been developed to address those concerns. Grazing lessees of category M and I allotments would be expected to provide actual use grazing reports to the BLM to verify the season grazed is within the grazing season on the lease. Grazing management would not be expected to change unless livestock are grazing outside of permitted use. There would be 104 more grazing lessees expected to provide actual use grazing reports in Alternatives B and D than in Alternatives A and C.

Use of yearling factors of 0.7 AU for yearling cattle to establish stocking rate and calculating AUM usage would have no impact on livestock grazing. Yearling factors are already in use throughout the planning area, although this procedure has never been standardized which has resulted in a great deal of variability in use.

The number of AUMs available for livestock grazing on the Westside pasture of the Fort Meade ACEC's Bear Butte Allotment would remain the same among all alternatives. Splitting the Westside Pasture from the Bear Butte allotment to make a separate Section 15 grazing allotment in Alternatives B and D would have negligible impacts on livestock grazing. The grazing lessee on the Westside Pasture Allotment would pay the base fee for an AUM instead of the bid amount tied to the rest of the Fort Meade ACEC.

Livestock grazing within the Exemption Area would be allowed on 2,957 acres with up to 492 AUMs permitted. This is more than under Alternatives A and C, resulting in a beneficial impact to livestock grazing.

Fire Management and Ecology: Livestock grazing would be deferred up to one year before prescribed fire to ensure adequate fuel is present to carry a prescribed fire and for a minimum of one growing season following treatment to promote recovery of vegetation. An estimated 270 AUMs would become temporarily unavailable for grazing on 1,000 acres of BLM land treated annually with prescribed fire. Lessees affected by site-specific actions would need to provide alternative food sources for their livestock. Aside from temporary loss of forage, fire can benefit livestock grazing by improving the quality, quantity, and availability of forage in the long term. The number of lessees affected by prescribed fire would be greater in Alternatives B and D than in Alternatives A and C, as more acres would be treated with prescribed fire annually. The impacts to those lessees would be slightly less than in Alternative C, as they would be required to provide alternative food sources for their livestock for one year instead of two years.

Lands and Realty: Up to 150 acres and 37 AUMs on the Fort Meade ACEC could be removed from grazing allotments through public land transfers to the Black Hills National Cemetery and the National Guard. This would have a minor impact on livestock grazing compared to Alternative C, where land transfers would not be considered and therefore would not impact livestock grazing, and Alternative A, where land transfers have not been fully addressed.

Paleontological Resources: BLM review of proposed surface-disturbing projects and potential field surveys for paleontological resources would increase costs to livestock grazing operations by requiring additional surveys and design changes to projects. Impacts to grazing management would be greater than under Alternative A, where proposed projects would be reviewed on a case-by-case basis. There would be fewer impacts to grazing than under Alternative C, where field surveys would be completed for all PFYC three, four, and five geologic formations prior to approval of surface-disturbing activities. Impacts to livestock grazing would mainly be evident through delayed project approval, with overall impacts minor since new range improvement projects are limited on BLM lands.

Recreation: The Exemption Area would be designated as a SRMA with emphasis on trail development. This, combined with Alternatives B and D having the most available acres for grazing allotments, indicates that the potential for recreation/livestock conflict would increase slightly over Alternatives A and C. There would be an increased incidence of gates being left open and some harassment of livestock from recreationists and dogs. Impacts to livestock grazing from recreation would be negligible across the planning area.

Vegetative Communities: The number of acres treated through mechanical methods and prescribed fire would be greatest in Alternatives B and D, with an estimated 1,400 acres treated per year. Removing overstory vegetation and old decadent growth allows new growth to occur. A short-term increase in forage quantity would be expected (Moore, et al. 2006). Vegetation treatments would maintain forage quantity in the long term in areas that would otherwise have a decrease in forage through encroachment of trees and shrubs. There would be greater forage quantity for livestock and wildlife in Alternatives B and D than in Alternatives A and C.

Poisonous plants could be treated, where found, using IPM methods. This would maximize opportunities to limit livestock production and death loss due to poisonous plant ingestion.

Visual Resources: Special design (location, size, and camouflage painting) to semi-permanent and permanent range improvement facilities may be required on 274,000 acres within VRM Classes 1 through 4, which may increase costs to livestock grazing operations by requiring additional surveys and design changes to projects. Impacts would be the same as Alternatives C and D. Impacts would be greater than Alternative A, where special design may only be required on 1,231 acres within VRM Class 2. Impacts to livestock grazing would be minor.

Water Resources: At the implementation level any proposed projects that are located in areas identified as floodplains (NRCS flooded soil data set) would be evaluated for features that the floodplains restriction is designed to protect and the restriction applied when such features are present. This indicates that range improvements could be restricted or special design features required if such range improvement projects are determined at the project level to impair water quality. This would have minimal impact on livestock grazing since most range improvement projects which are planned in or around frequently floodplains are designed to reduce livestock grazing along riparian areas and improve riparian habitat.

Wildlife and Special Status Species: Grazing leases for domestic sheep and goats would not be approved within five miles of bighorn sheep range (3,343 acres). An estimated 904 AUMs involving 11 allotments would not be available for domestic sheep and goat grazing. They would continue to be available for cattle, horse, or bison grazing. Currently, no allotments are authorized for domestic sheep or goats within five miles of bighorn sheep range. Impacts to livestock grazing would be negligible.

Reintroduction of prairie dogs on public land would not be considered in Alternative B. There would be no impacts to livestock grazing from this alternative.

Allowing livestock grazing on the Fort Meade ACEC from May 1 through October 31 would have a negligible impact on livestock grazing on the three allotments within the Fort Meade ACEC compared to Alternatives A and C. The number of livestock would decrease slightly for the longer grazing season, compared to Alternatives A and C, to utilize available AUMs on the allotments.

Impacts under Alternative C

Available BLM-administered surface for livestock grazing would be approximately 271,000 acres and support an estimated 73,400 AUMs. The current grazing permitted use would be maintained through implementation of AMPs, range improvements, and vegetation manipulation. AMPs would be developed according to resource conditions and grazing operator cooperation. If these measures fail to provide the permitted use objective while providing for protection of other resource values as established in the RMP, livestock reductions may become necessary.

Any adjustments in livestock grazing use would be made as a result of monitoring and in consultation with grazing lessees and other interested publics. Alternatives A, B, and D would maintain slightly more AUMs available for permitted use than Alternative C with a negligible impact to livestock grazing across the planning area.

There would be 100,160 and 43,897 acres of Closed and NSO surface disturbance stipulations for oil and gas production (Table 4-30), respectively for BLM-administered surface lands within Alternative C. There would also be 199,420 acres of ROW exclusion areas (Table 4-31). These acres include all stipulations and consider the overlap of various stipulations as described in the Vegetative Communities section. Surface-disturbing activities would have the least reduction in forage production and, therefore, the least effect on livestock grazing of all the alternatives. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain the Standards for Rangeland Health.

A reduction, suspension, or elimination of livestock grazing may occur on allotments where grazing preference is relinquished during the life of the RMP to protect other resource values. Changes in AUM allocations have more impact on individual allotments than they do on AUM allocations across the Decision Area. Alternatives C and D could have a negligible decrease in overall AUMs. Conversion of native pasture to tame pasture would not be allowed. There would be no expected AUM increase from pasture conversion, with the possibility of an AUM decrease where native species are not able to re-establish the desired ecosystem functions (D'Antonio and Meyerson 2002).

Allowable utilization would be limited to 50 percent on all allotments that do not contain approved specific management objectives and established grazing strategies. Management changes would be implemented if the 50 percent utilization was exceeded on a pasture-wide basis or on selected key areas for three consecutive years on any given allotment. The opportunity to apply adaptive management principles to adjust management in a timely manner based on new information or actual range conditions is not available under Alternative C. Management direction for Alternative C is more definitive than Alternative A and less definitive than Alternatives B and D. Overall impacts to livestock grazing within the planning area would be negligible with minor impacts to individual allotments.

An estimated 48 grazing leases could be renewed and 21 leases transferred on category M and C allotments each year through preparation of a DNA. The screening criteria checklist (Appendix L) would ensure that allotments meet the intent of the previous NEPA document, and no new issues have been identified. Impacts to livestock grazing would be negligible.

A site-specific interdisciplinary environmental review would be undertaken when the following situations arise during grazing lease transfers and lease renewals: grazing use would substantially differ from that authorized in the previous grazing lease, other factors have developed to change management circumstances, or land health standards are not being met because of livestock grazing.

There would be no year-long leases on M or I allotments. All M or I category allotments would be required to have a grazing season established on the lease that is less than year-long. Grazing lessees of category M and I allotments would be expected to provide actual use grazing reports to BLM to verify the season grazed is within the grazing season on the lease. Grazing management would not be expected to change unless livestock are grazing outside of permitted use. There would be 104 fewer grazing lessees expected to provide actual use grazing reports in Alternative A than Alternatives B, C, and D.

Use of yearling factors of 1.0 AU instead of 0.7 for yearling cattle to establish stocking rate and calculating AUM usage would have a negligible impact on livestock grazing. Yearling factors of 0.7 are already in use throughout the planning area, although this procedure has never been standardized which has resulted in a great deal of variability in use. Twenty eight grazing lessees that are permitted to run yearling cattle would be authorized to run fewer cattle under their grazing lease.

Livestock grazing within the Exemption Area would be limited to the 1,349 acres and 224 AUMs currently leased. This is less than half the AUMs that would be available to livestock grazing in Alternatives B and D.

Fire Management and Ecology: Livestock grazing would be deferred up to one year before prescribed fire to ensure adequate fuel is present to carry a prescribed fire and for a minimum of two growing seasons following treatment to promote recovery of vegetation. An estimated 270 AUMs would become temporarily unavailable for grazing on 1,000 acres of BLM land with an estimated 500 acres treated with prescribed fire annually.

The number of lessees affected by site-specific actions that would require them to provide alternative food sources for their livestock would be slightly less than in Alternatives B and D and more than in Alternative A. The impacts to those

lessees would be slightly greater than Alternatives B and D, as they would be required to provide alternative food sources for their livestock for two years instead of one. Aside from temporary loss of forage, fire can benefit livestock grazing by improving the quality, quantity, and availability of forage in the long term.

Lands and Realty: No public land transfer or authorization would occur to transfer lands in the Fort Meade ACEC to the Black Hills National Cemetery and the National Guard. Therefore, there would be no impact on livestock grazing.

Paleontological Resources: The BLM would require field surveys for paleontological resources to be completed for all PFYC three, four, and five geologic formations prior to approval of surface-disturbing activities on about 267,000 acres. The required surveys would increase costs to livestock grazing operations by requiring additional surveys and design changes to projects. Impacts to grazing management would be greater in Alternative C than Alternatives A, B, and D, where proposed projects would be reviewed on a case-by-case basis or where surveys would be considered, but not required, for proposed surface-disturbing activities. Impacts to livestock grazing would mainly be evident through delayed project approval with overall impacts minor seeing that new range improvement projects are limited on BLM lands.

Vegetative Communities: The number of acres treated through mechanical methods and prescribed fire would be fewer in Alternative C than Alternatives B and D, with an estimated 850 acres treated per year. Removing overstory vegetation and old decadent growth allows new growth to occur. A short-term increase in forage quantity would be expected (Moore, et al. 2006). Vegetation treatments would maintain forage quantity in the long term in areas that would otherwise have a decrease in forage through encroachment of trees and shrubs. There would be less forage quantity for livestock and wildlife in Alternatives A and C than in Alternatives B and D.

Poisonous plants would be treated only in developed recreation areas and along recreation trails. This would minimize opportunities for limiting livestock production and death loss due to poisonous plant ingestion.

Introduced vegetative species are dominant throughout portions of the Fort Meade ACEC. Alternative C would manage strictly for native plants with the intent to eliminate or drastically reduce the levels of non-native herbaceous plant species while maintaining or improving all rangeland uplands and riparian areas to PFC. Conversion to native species would be a primary focus. Conversion to native vegetative species would reduce the AUMs available on the Fort Meade ACEC, therefore, AUMs would be decreased slightly in Alternative C, while Alternatives A, B, and D would maintain AUMs. Forage would be temporarily unavailable to livestock grazing while native plant species are being established.

Visual Resources: Special design (location, size, and camouflage painting) to semi-permanent and permanent range improvement facilities may be required on 274,000 acres within VRM Classes 1 through 4, which may increase costs to livestock grazing operations by requiring additional surveys and project design changes. Impacts would be the same as Alternatives B and D. Impacts would be greater than Alternative A, where special design may only be required on 1,231 acres within VRM Class 2. Impacts to livestock grazing would be minor.

Water Resources: At the implementation level any proposed projects that are located in areas identified as floodplains (NRCS flooded soils data set) would be evaluated for features that the frequently flooded restriction is designed to protect and the restriction applied when such features are present. This indicates that range improvements could be restricted or special design features required if such range improvement projects are determined at the project level to impair water quality. This would have minimal impact on livestock grazing since most range improvement projects which are planned in or around floodplains are designed to reduce livestock grazing along riparian areas and improve riparian habitat.

Wildlife and Special Status Species: Livestock grazing on allotments not meeting Standards would be prohibited from December 1 to March 31 within crucial winter range for big game unless such use is needed to improve range condition or manage wildlife. Of the seven percent of BLM lands not meeting Standards, roughly one percent is due to current livestock grazing management. Impacts to livestock grazing would be negligible across the planning area while impacts could be substantial for individual allotments.

Grazing leases for domestic sheep and goats would not be approved within 15 miles of bighorn sheep range (7,590 acres). An estimated 2,051 AUMs involving 32 allotments would not be available for domestic sheep and goat grazing.

They would continue to be available for cattle, horse, or bison grazing. Currently, no allotments are authorized for domestic sheep or goats within 15 miles of bighorn sheep range. Impacts to livestock grazing would be negligible.

Reintroduction of prairie dogs on public land would be considered on large blocks of public land with a minimum of 10,000 or more contiguous acres of public land. Other resource uses would be considered prior to introduction. Impacts to livestock grazing and AUMs would be analyzed at a project level. There would be a moderate impact with a decrease in total authorized AUMs in any area where prairie dogs are reintroduced on a large scale.

Limiting livestock grazing on the Fort Meade ACEC to May 15 through October 15 would have a minor impact on livestock grazing on the three allotments within the Fort Meade ACEC compared to Alternatives B and D, and the same impact as Alternative A. Compared to Alternatives B and D, the number of livestock would be increased slightly for the shorter grazing season to utilize available AUMs on the allotments.

***Special Designations**:* Designation of a sage-grouse PPA ACEC would still allow grazing, but such a designation may increase management needs and complexity and would increase operating expenses for those that lease BLM grazing allotments within Greater Sage-Grouse PPAs. Obtaining approval to construct or install range improvements would be more difficult. In many cases, lessees would choose to place range improvements on private or non-federal lands within or adjacent to the ACEC.

Impacts under Alternative D (Preferred Alternative)

Available BLM-administered surface for livestock grazing would be approximately 272,000 acres and support an estimated 77,300 AUMs. The current grazing permitted use would be maintained or increased through implementation of AMPs, range improvements, and vegetation manipulation. AMPs would be developed according to resource conditions and grazing operator cooperation. If these measures fail to provide the permitted use objective while providing for protection of other resource values as established in the plan, livestock reductions may become necessary. Any adjustments in livestock grazing use would be made as a result of monitoring and in consultation with grazing lessees and other interested publics.

Alternative D would have 6,894 and 107,025 acres of Closed and NSO surface disturbance stipulations for oil and gas development (Table 4-30), respectively for BLM-administered surface lands. There would be 5,836 acres of ROW exclusion areas and 191,704 acres of ROW avoidance areas (Table 4-31). These acres include all stipulations and consider the overlap of various stipulations as described in the Vegetative Communities section.

Surface-disturbing activities would have less of a reduction in forage production and therefore less effect on livestock grazing than Alternatives A and B with slightly more of an effect than Alternative C. Eliminating surface disturbances in these areas or only allowing activities that would not degrade vegetative communities or other resources would benefit efforts to achieve or maintain the Standards for Rangeland Health.

A reduction, suspension or elimination of livestock grazing may occur on allotments where grazing preference is relinquished during the life of the plan to protect other resource values. Changes in AUM allocations have more impact on individual allotments than they do on AUM allocations across the Decision Area. Alternatives C and D would have a negligible decrease in overall AUMs.

Conversion of native pasture to tame pasture would be allowed to improve, maintain, or protect habitat, sensitive soils, riparian vegetation, or special status plants or animals during vulnerable periods, and in cases where alternative forage sources are needed to defer or change livestock grazing patterns to reduce disturbance to wildlife (D'Antonio and Meyerson 2002).

Allowable utilization would be limited to 50 percent on all allotments that do not contain approved specific management objectives and established grazing strategies. The thresholds for management changes vary by alternative. Adaptive management within Alternatives B and D provides a framework for monitoring to be carried out before management changes would be implemented. Overall impacts to livestock grazing within the planning area would be negligible with minor impacts to individual allotments.

An estimated 48 grazing leases could be renewed and 21 leases transferred on category M and C allotments each year through preparation of a DNA. The screening criteria checklist (see Appendix L) would ensure that allotments meet the intent of the previous NEPA document and no new issues have been identified. Impacts to livestock grazing would be negligible.

Yearlong leases on M and I allotments would only be allowed where no resource concerns exist, or when an AMP or terms and conditions on the grazing lease have been developed to address those concerns. Grazing lessees of category M and I allotments would be expected to provide actual use grazing reports to the BLM to verify the season grazed is within the grazing season on the lease. Grazing management would not be expected to change unless livestock are grazing outside of permitted use. There would be 104 more grazing lessees expected to provide actual use grazing reports in Alternatives B, C, and D than Alternative A.

Use of yearling factors of 0.7 AU for yearling cattle to establish stocking rate and calculating AUM usage would have no impact on livestock grazing. Yearling factors are already in use throughout the planning area, although this procedure has never been standardized which has resulted in a great deal of variability in use.

The number of AUMs available for livestock grazing on the Westside pasture of the Fort Meade ACEC's Bear Butte Allotment would remain the same between all alternatives. Splitting the Westside pasture from the Bear Butte Allotment to make a separate Section 15 grazing allotment in Alternatives B and D would have negligible impacts on livestock grazing. The grazing lessee on the Westside pasture would pay the base fee for an AUM instead of the bid amount tied to the rest of the Fort Meade ACEC. If applications for grazing preference do not show that they will meet the goals and objectives of the Fort Meade ACEC and the pasture remains part of the Bear Butte Allotment there would be no impacts to livestock grazing.

Livestock grazing within the Exemption Area would be allowed on 2,957 acres with up to 492 AUMs, which is more than under Alternatives A and C and would be a positive impact to livestock grazing.

Fire Management and Ecology: Livestock grazing would be deferred up to one year before prescribed fire to ensure adequate fuel is present to carry a prescribed fire and for a minimum of one growing season following treatment to promote recovery of vegetation. An estimated 270 AUMs would become temporarily unavailable for grazing on 1,000 acres of BLM land treated with prescribed fire annually.

Lessees affected by site-specific actions would need to provide alternative food sources for their livestock. Aside from temporary loss of forage, fire can benefit livestock grazing by improving the quality, quantity and availability of forage in the long term. The number of lessees affected by prescribed fire would be greater in Alternatives B and D than Alternatives A and C, as more acres would be treated with prescribed fire annually. The impacts to those lessees would be slightly less than Alternative C as they would be required to provide alternative food sources for their livestock for one year instead of two.

Lands and Realty: Up to 150 acres and 37 AUMs could be removed from grazing allotments on the Fort Meade ACEC through public land transfers to the Black Hills National Cemetery and the National Guard. This would have a minor impact on livestock grazing compared to Alternative C where land transfers would not be considered, and therefore would not impact livestock grazing, and Alternative A where the land transfers have not been fully addressed.

Paleontological Resources: BLM review of proposed surface-disturbing projects and potential field surveys for paleontological resources would increase costs to livestock grazing operations by requiring additional surveys and design changes to projects. The impacts to grazing management would be greater than in Alternative A, where proposed projects would be reviewed on a case-by-case basis. There would be fewer impacts to grazing than under Alternative C where field surveys would be completed for all PFYC three, four, and five geologic formations prior to approval of surface-disturbing activities. Impacts to livestock grazing would mainly be evident through delayed project approval with overall impacts minor since new range improvement projects are limited on BLM lands.

Recreation: The Exemption Area would be designated as a SRMA with emphasis on trail development. This combined with Alternatives B and D having the most available acres for grazing allotments indicate that the potential for recreation/livestock conflict would increase slightly over Alternatives A and C. There would be an increased incidence

of gates being left open and some harassment of livestock from recreationists and dogs. Impacts to livestock grazing from recreation would be negligible across the planning area.

Vegetative Communities: The number of acres treated through mechanical methods and prescribed fire would be greatest in Alternatives B and D with an estimated 1,400 acres treated per year. Removing overstory vegetation and old decadent growth allows new growth to occur. A short-term increase in forage quantity would be expected (Moore, et al. 2006). Vegetation treatments would maintain forage quantity in the long term in areas that would otherwise have a decrease in forage through encroachment of trees and shrubs. There would be greater forage quantity for livestock and wildlife in Alternatives B and D than in Alternatives A and C.

Poisonous plants could be treated, where found, using IPM methods. This would maximize the opportunities for limiting livestock production and death loss due to poisonous plant ingestion.

Visual Resources: Special design (location, size, and camouflage painting) to semi-permanent and permanent range improvement facilities may be required on 274,000 acres within VRM Classes 1 through 4, which may increase costs to livestock grazing operations by requiring additional surveys and design changes to projects. Impacts would be the same as Alternatives B and C. Impacts would be greater than Alternative A, where special design may only be required on 1,231 acres within VRM Class 2. Impacts to livestock grazing would be minor.

Water Resources: At the implementation level any proposed projects that are located in areas identified as floodplains (NRCS flooded soils data set) would be evaluated for features that the frequently flooded restriction is designed to protect and the restriction applied when such features are present. This indicates that range improvements could be restricted or special design features required if such range improvement projects are determined at the project level to impair water quality. This would have minimal impact on livestock grazing since most range improvement projects which are planned in or around floodplains are designed to reduce livestock grazing along riparian areas and improve riparian habitat.

Wildlife and Special Status Species: Grazing leases for domestic sheep and goats would not be approved within 15 miles of bighorn sheep range (7,590 acres). An estimated 2,051 AUMs involving 32 allotments would not be available for domestic sheep and goat grazing. They would continue to be available for cattle, horse, or bison grazing. Currently, no allotments are authorized for domestic sheep or goats within 15 miles of bighorn sheep range. Impacts to livestock grazing would be negligible.

If proposals to reintroduce prairie dogs are received, the BLM would consider reintroduction on vacant historic prairie dog colonies if the proposals are on large unfragmented blocks of public land (minimum of 10,000 or more acres of public land), adjoining landowners are cooperative, and relocations do not occur with one mile of private land. Conflicts with other uses would be considered prior to approval. The impacts to livestock grazing and AUMs would be analyzed at the project level. There would be a moderate impact with a decrease in total authorized AUMs in any area where prairie dogs are reintroduced on a large scale.

Allowing livestock grazing on the Fort Meade ACEC from May 1 through October 31 would have a negligible impact on livestock grazing on the three allotments within the Fort Meade ACEC compared to Alternatives A and C. The number of livestock would be decreased slightly for the longer grazing season compared to Alternatives A and C to utilize available AUMs on the allotments.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present actions that affect and have affected livestock grazing include mineral exploration and development, lands and realty surface-disturbing ROWs, livestock grazing, and vegetation treatments. In general, these actions have all had cumulative adverse impacts on livestock grazing by creating surface disturbance that results in a greater percentage of bare ground, which causes soil erosion, vegetation loss, forage loss, and fragmentation of landscapes.

Beneficial impacts include vegetation treatments that improve vegetative cover and diversity along with improved forage production in the long term. Reasonably foreseeable development actions in the planning area and on federal, state, private, and other lands within and adjacent to the planning area that could adversely impact livestock grazing include ongoing mineral exploration, development, and production; renewable energy development; livestock grazing that does not follow Guidelines for Livestock Grazing Management (Appendix A); and vegetation treatments for fire management and forest health.

Over the life of the plan 1,400 acres of upland and approximately 4 miles of riparian areas are expected to improve through the implementation of Standards for Rangeland Health. This would increase plant diversity and forage production on the allotted acres. Improved rangeland condition on the 1,400 acres and 4 miles of riparian areas would indicate an improvement in surrounding private and other non-BLM-administered lands due to the fragmented land pattern. The number of acres affected would vary by pasture size.

BLM-administered land not meeting Standards would continue to be equal to or less than 16,400 acres, mainly as a result of introduced plant species such as smooth brome, crested wheatgrass, and annual bromes referred to as cheatgrass. The areas where smooth brome and crested wheatgrass have invaded would continue to see a spread of these species into surrounding areas. This would generally increase forage production for cattle in affected areas, although grazing use would be limited to mostly cool season in areas of crested wheatgrass dominance as plant diversity would decrease and limit the amount of warm season forage available after mid-June.

Areas that have been assessed and are not meeting Standards due to cheatgrass would see a cyclical pattern of increases and decreases in brome abundance. Cheatgrass generally becomes abundant when fall moisture is high followed by dry spring and summer months. The decrease in vegetation production from drought would have more of an impact to livestock grazing than the cyclical pattern of cheatgrass.

Private and other non-BLM-administered lands have major impacts to riparian reaches on BLM-administered lands. The comingled land ownership pattern results in situations where most stream reaches contained on BLM land are less than one mile in length with private or other non-BLM-administered lands on either side of the reach. Capability issues are affecting a majority of the streams that were rated as FAR. Of the 16 miles rated as FAR or NF, approximately 13 miles are not meeting PFC due to capability issues; upstream activities on private land, flow control (dams), and historical alteration of the stream channel were the main reason that most areas were found to be functioning at risk or non-functioning within the planning area. A portion of the FAR determinations were attributed to drought as a capability issue.

It is expected that the approximately 13 miles rated at FAR or NF due to capability issues arising from lands other than BLM, would continue to not meet PFC due to land management on other lands. Livestock water would continue to be available in stock ponds on non-BLM-administered lands within pastures containing FAR stream reaches. Livestock access to various portions of pastures may become limited in locations where stream reaches have become extremely incised due to dam failures. The BLM would coordinate with other landowners to implement practices to improve riparian conditions toward PFC on all lands that are not meeting PFC.

The areas considered in the analysis in this section are the nine counties with substantial amounts of BLM surface and mineral estate (Harding, Butte, Lawrence, Pennington, Custer, Fall River, Meade, Perkins, and Stanley counties). Wheat, flax, hay, and sunflowers are the major crops produced on private land in this area. Of the 12.7 million acres in these counties about 50 percent of the area is rangeland.

Compared to other areas, the Northern Great Plains is experiencing a high conversion rate of grasslands to croplands (USDA, Economic Research Service, 2007). Between 1997 and 2007, USDA estimated that 1.1 percent of rangeland was lost due to cropland conversion in a 77 county study area that was completed for portions of North and South Dakota and western Nebraska (USDA Economic Research Service, 2011). Major factors that influenced this trend include changes in market incentive loans, changes in farm programs such as CRP and changes in crop disaster insurance. Other major factors include market factors, interest rates, production costs and increased yield as a result of improved technology.

Based on information in the 2011 USDA report and a review of Natural Agriculture Statistics data, Resources Inventory on planted acres, the BLM estimates that a maximum of 66,000 acres of rangeland on privately owned surface are likely

to be converted to cropland in the nine counties listed above over the next ten years. If trends continue in this manner, a maximum of 132,000 acres of rangeland may be converted to cropland over the next 20 years. This would remove roughly 35,700 AUMs from livestock production, although some of this land could be grazed following crop removal.

The majority of this conversion would result in surface disturbance, although certain farm practices such as no-till farming and other conservation practices would reduce the degree of disturbance. The acres provided are the maximum number of acres that are expected to be converted from grassland to cropland; actual acres may be lower in certain counties such as western Butte County where soils have lower potential for farming. In addition, areas with marginal soils that receive less than 16 inches of annual precipitation may receive lower levels of conversion of rangeland to croplands. In the nine-county area, the BLM estimates that wind energy development would result in up to 3,500 acres of short-term disturbance and 900 acres of long-term disturbance on lands that are not administered by the BLM (other federal lands, private, state, tribal lands, etc.). The maximum levels of wind energy development on BLM-administered surface estate are expected to result in 924 acres of short-term disturbance and 231 acres of long-term disturbance.

The BLM estimates that the conversion of all lands in these counties for other uses such as transportation, infrastructure, and building would occur at a much lesser rate than conversion of rangeland to farm land; however, specific figures are not available. On a nationwide basis, USDA has determined that urban land acreage increased at about twice the rate of population growth in the years 1945 to 2007 (USDA 2007). Urban growth in the nine-county analysis area described in this section is expected to be slow as many of the counties are experiencing slow, static or declining population changes. For example, the population of Harding County in northwest SD declined by seven percent and the population of the county seat (Buffalo, SD) declined by 13 percent from 2000 to 2010. The exception to this trend is the northern Black Hills and nearby areas along the Interstate 90 corridor where subdivision, infrastructure development, and population growth is much higher than in other portions of the nine-county cumulative analysis area. For more information about the population growth by area, refer to the Population portion of the Social section of Chapter 3.

Oil and gas development could result in a maximum of 2,380 acres of short-term disturbance (449 wells) and 1,437 acres of long-term disturbance on other (non-BLM-administered) lands in the nine-county area.

Oil and gas development on BLM-administered federal minerals (including BLM surface estate) is expected to result in a maximum of 138 to 301 acres of long-term surface disturbance (43-94 wells). Development of other BLM-administered minerals is expected to result in a maximum of 400 acres of short-term disturbance and 100 acres of long-term disturbance in the nine-county area. Bentonite mining would account for most of the acres disturbed.

Table 4-44 was developed using a combination of sources including the USDA reports cited above (USDA 2007, 2011, 2012), conversations with the mining industry (2010-2012), SD DENR (2012), and the SD RMP development scenarios including the Oil and Gas RFD. The AUMs below represent the maximum number of AUMs impacted under any alternative.

Table 4-44
Maximum Number of AUMs Expected to Receive Long-Term Alteration*

Activity/Use	*AUMs of Non-BLM Lands (private, state, tribal, other federal lands altered)*	*AUMs of BLM Surface Estate Altered (does not include split estate lands)*	*AUMs of BLM Surface and Split Estate Lands Altered*
Conversion of rangeland to cropland	35,700	0	0
Wind energy development	243	63	81
Oil and gas development	388	13	135
Development of locatable, salable, other leasable minerals	168	3	27
Other uses (transportation, buildings, vegetation treatments, etc.)	unknown	24	37
Total	36,475	102	280

* Disturbance of soil, major conversion of vegetation to another vegetation type over the long-term or conversion of land use.

The amount of disturbance on BLM-administered surface estate only would range from 325 to 376 acres (0.00003 percent of the nine counties) of short-term disturbance and 1,950 to 2,290 acres (0.0002 percent of the nine counties) of long-term disturbance under the various alternatives (long-term disturbance is the amount of short-term disturbance that is not reclaimed). The expected levels of surface disturbance from all sources on BLM-administered surface estate are shown in Table 4-23 and also described in the development scenarios at the beginning of this chapter. Under any of the management alternatives, the level of adverse cumulative impacts to livestock grazing would be negligible because 1) the reduction in AUMs on BLM surface and mineral estate would be very small in relation to the landscape affected; 2) the reduction in AUMs would occur in different watersheds over a 20 year period and; 3) 80-85 percent of the disturbance would be reclaimed.

Actions that result in short-term surface disturbance on both BLM surface and mineral estate (split estate) would range between 4,637 to 5,067 acres of short-term disturbance and 811 to 887 acres of long-term disturbance under the various alternatives. In terms of short-term disturbance, this amounts to a 0.0004 percent of the 12.7 million acres in the nine-county analysis area. In terms of long-term disturbance, this amounts to 0.00007 percent of the 12.7 million acres in the nine-county analysis area.

Cumulative Impacts under Alternative A (Current Management)

Alternative A would result in similar levels of impacts to livestock grazing as described in Cumulative Impacts Common to All Alternatives, in addition to the following impacts.

Under Alternative A, it is anticipated that up to 1,966 acres of short-term surface disturbance, which is less than 1 percent of the 274,000 acre Decision Area, could occur on BLM-administered surface over the next 20 years (Table 4-23). This would result in a loss of up to 572 AUMs in the short term. Prescribed fire would result in a temporary reduction of 58 AUMs on BLM-administered lands, raising the total temporarily suspended AUMs to 630. Forage production would be expected to increase in the long term following prescribed fire due to a reduction in competition from tree overstory and a reduction in litter accumulation.

The AUMs would likely be suspended on individual leases until all reclamation was complete. Surface disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 376 acres of long-term soil disturbance with a reduction of 112 AUMs.

RFDs projected oil and gas development, renewable energy, and bentonite mining in the planning area. Private land range improvement construction surface disturbance was projected from 2007 to 2010 NRCS data. These activities would result in an additional 1,628 acres of surface disturbance for oil and gas (these acres include all non-BLM-administered surface acres which include lands where BLM manages subsurface acres), 278 acres for renewable energy, 423 acres for bentonite mining, and 28 acres of range improvement projects by NRCS for a total of 2,357 long-term surface disturbance acres on non-BLM-administered surface lands within the planning area. This would result in a reduction of 637 AUMs on non-BLM-administered surface acres. Therefore, a cumulative loss of at least 749 AUMs public and private is projected under Alternative A.

Surface-disturbing activities result in direct reduction of livestock forage and create open spaces for noxious weeds and other invasive species to establish.

The difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to livestock grazing are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Cumulative Impacts under Alternative B

Alternative B would result in similar levels of vegetation disturbance as described in Cumulative Impacts Common to All Alternatives, in addition to the following impacts.

Potentially converting 8,220 acres of native pastures to tame pastures would result in a reduction of native rangelands on up to 3 percent of the decision area. It is estimated that less than 1 percent (2,740 acres) of the Decision Area has previously been converted to tame grass species; mainly a result of the spread of crested wheatgrass and smooth brome

from surrounding private lands onto small BLM parcels of 160 acres or less. Forage production could be increased cumulatively on up to 10,960 acres or 4 percent of the Decision Area under this Alternative. Conversions would be based on ecological needs, but would have a benefit to livestock through increased forage production.

Under Alternative B, it is anticipated that up to 2,174 acres of short-term surface disturbance, which is less than 1 percent of the 274,000 acre Decision Area, could occur on BLM-administered surface over the next 20 years (Table 4-23). This would result in a loss of up to 509 AUMs in the short term. Prescribed fire would result in a temporary reduction of 270 AUMs on BLM-administered lands, raising the total temporarily suspended AUMs to 779. Forage production would be expected to increase in the long term following prescribed fire due to a reduction in competition from tree overstory and a reduction in litter accumulation.

Surface disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 325 acres of long-term soil disturbance with a reduction of 68 AUMs. Lands and Realty actions on the Fort Meade ACEC could potentially remove 150 acres and 37 AUMs of forage. An additional 1,608 acres could be leased within the Exemption Area. This could provide an additional 268 AUMs of livestock forage. Therefore, the cumulative impact of Alternative B would be an increase of 163 AUMs on BLM lands.

RFDs projected oil and gas development, renewable energy, and bentonite mining in the planning area. Private land range improvement construction surface disturbance was projected from 2007 to 2010 NRCS data. These activities would result in an additional 1,628 acres of surface disturbance for oil and gas (these acres include all non-BLM-administered surface acres which include lands where BLM manages subsurface acres), 278 acres for renewable energy, 423 acres for bentonite mining, and 28 acres of range improvement projects by NRCS for a total of 2,357 long-term surface disturbance acres on non-BLM-administered surface lands within the planning area. This would result in a reduction of 637 AUMs on non-BLM-administered surface acres. Therefore, a cumulative loss of at least 474 AUMs public and private is projected under Alternative B.

Surface-disturbing activities result in direct reduction of livestock forage and create open spaces for noxious weeds and other invasive species to establish.

The difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to livestock grazing are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Cumulative Impacts under Alternative C

Alternative C would result in similar levels of vegetation disturbance as described in Cumulative Impacts Common to All Alternatives in addition to the following impacts.

It is estimated that less than 1 percent of the Decision Area (2,740 acres) has previously been converted to tame grass species; mainly a result of the spread of crested wheatgrass and smooth brome from surrounding private lands onto small BLM parcels of 160 acres or less. Seral stage diversity could slowly be reduced as tame grass species continue to spread onto native mixed grass prairie. There would be no additional acres converted to tame species on BLM-administered lands, therefore increased forage production due to tame species would be limited.

Under Alternative C, it is anticipated that up to 1,651 acres of short-term surface disturbance, which is less than 1 percent of the 274,000 acre Decision Area, could occur on BLM-administered surface over the next 20 years (Table 4-23). This would result in a loss of up to 401 AUMs in the short term. Prescribed fire would result in a temporary reduction of 270 AUMs on BLM-administered lands, raising the total temporarily suspended AUMs to 671. Forage production would be expected to increase in the long term following prescribed fire due to a reduction in competition from tree overstory and a reduction in litter accumulation.

Surface disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 253 acres of long-term soil disturbance with a reduction of 55 AUMs.

RFDs projected oil and gas development, renewable energy, and bentonite mining in the planning area. Private land range improvement construction surface disturbance was projected from 2007 to 2010 NRCS data. These activities would result in an additional 1,628 acres of surface disturbance for oil and gas (these acres include all non-BLM-

administered surface acres which include lands where BLM manages subsurface acres), 278 acres for renewable energy, 423 acres for bentonite mining, and 28 acres of range improvement projects by NRCS for a total of 2,357 long-term surface disturbance acres on non-BLM-administered surface lands within the planning area. This would result in a reduction of 637 AUMs on non-BLM-administered surface acres. Therefore, a cumulative loss of at least 692 AUMs public and private is projected under Alternative C.

Surface-disturbing activities result in direct reduction of livestock forage and create open spaces for noxious weeds and other invasive species to establish.

The difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to livestock grazing are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D would result in similar levels of vegetation disturbance as described in Cumulative Impacts Common to All Alternatives in addition to the following impacts.

Potentially converting 2,740 acres of native pastures to tame pastures would result in a reduction of native rangelands on up to 1 percent of the Decision Area. It is estimated that less than 1 percent of the Decision Area (2,740 acres) has previously been converted to tame grass species; mainly a result of the spread of crested wheatgrass and smooth brome from surrounding private lands onto small BLM parcels of 160 acres or less. Forage production could be increased cumulatively on up to 5,480 acres or 2 percent of the Decision Area under this Alternative. Conversions would be based on ecological needs, but would have a benefit to livestock through increased forage production.

Under Alternative D, it is anticipated that up to 2,290 acres of short-term surface disturbance, which is less than 1 percent of the 274,000 acre Decision Area, could occur on BLM-administered surface over the next 20 years (Table 4-23). This would result in a loss of up to 558 AUMs in the short term. Prescribed fire would result in a temporary reduction of 270 AUMs on BLM-administered lands, raising the total temporarily suspended AUMs to 828. Forage production would be expected to increase in the long term following prescribed fire due to a reduction in competition from tree overstory and a reduction in litter accumulation.

Surface disturbances would not occur all at one time. Interim reclamation would reduce impacts to approximately 354 acres of long-term soil disturbance with a reduction of 81 AUMs. Lands and Realty actions on the Fort Meade ACEC could potentially remove 150 acres and 37 AUMs of forage. An additional 1,608 acres could be leased within the Exemption Area. This could provide an additional 268 AUMs of livestock forage. Therefore the cumulative impact of Alternative D would be an increase of 150 AUMs on BLM lands.

RFDs projected oil and gas development, renewable energy, and bentonite mining in the planning area. Private land range improvement construction surface disturbance was projected from 2007 to 2010 NRCS data. These activities would result in an additional 1,628 acres of surface disturbance for oil and gas (these acres include all non-BLM-administered surface acres which include lands where BLM manages subsurface acres), 278 acres for renewable energy, 423 acres for bentonite mining, and 28 acres of range improvement projects by NRCS for a total of 2,357 long-term surface disturbance acres on non-BLM-administered surface lands within the planning area. This would result in a reduction of 637 AUMs on non-BLM-administered surface acres. Therefore, we are projecting a cumulative loss of at least 487 AUMs public and private under Alternative D.

Surface-disturbing activities result in direct reduction of livestock forage and create open spaces for noxious weeds and other invasive species to establish.

The difference in impacts between alternatives is anticipated to be minimal. Cumulative adverse impacts to livestock grazing are anticipated to be minor to moderate at local scales and negligible to minor across the planning area.

Recreation

This section describes environmental consequences as specifically as possible, but because RMP decisions are mostly broad resource allocations, a high degree of specificity often is not possible. Site-specific analysis normally is conducted as RMP decisions are implemented on the ground. For the purpose of this analysis, short-term impacts occur within five years of a given management action. Long-term impacts continue past five years or take more than five years to materialize. Impacts are assessed in terms of intensity or degree, minor or low to major or high.

Assumptions

Assumptions used in this impact analysis include the following:

Demand for recreational use of BLM land is expected to increase over the life of the plan.

Total visitor days, under existing management, would increase about 1/2 of one percent per year over the next 20 years (RMIS database 2000-2010).

Increased recreational uses such as hunting, fishing, hiking, wildlife viewing, and other dispersed uses are expected.

Many developed recreation opportunities are available on lands other than BLM lands.

Direct effects to recreation affect recreational use of BLM land and facilities. For example, oil and gas development actions may displace recreational uses from a given area, thus directly affecting recreation. An example of an indirect effect is where competing uses of the land adversely affect wildlife habitats, resulting in a decrease in big game populations and, therefore, a decrease in hunting (recreational) opportunities. Beneficial effects to recreational resources include actions that improve the recreational setting and contribute to desired recreational experiences and opportunities. Adverse effects are those that adversely affect the recreational setting and detract from the recreational experiences and opportunities of users.

Under all alternatives, some activities related to resource development (construction of facilities, land clearing, and drilling activities related to minerals exploration and development; ROWs; and transportation) result in adverse effects or displacement of recreational opportunities and degradation of recreational experiences for the life of those projects. Conversely, some development activities present opportunities to improve legal access to BLM land, as well as to improve roads. In addition, management actions limiting development activities, such as developing stipulations (no surface development restrictions, CSU restrictions, and “no-leasing” restrictions) and mineral withdrawals could benefit recreation by protecting recreational opportunities and providing long-term assurance that areas traditionally used for recreational purposes would not be affected by future development activities.

Impacts Common to All Alternatives

Consolidating land ownership and affording additional public access to lands within the planning area increases recreational opportunities for users seeking both primitive and more developed recreational experiences.

Managing certain resources would influence recreational use patterns, opportunities, and preferences within the planning area to a limited extent. For example, current management actions for oil and gas development affect vegetation, water, and soil, and are anticipated to influence distribution of fish and wildlife throughout the planning area, thereby influencing recreational use. Maintenance of fish and wildlife populations from stipulating protective measures on their habitats for oil and gas development translates to maintained recreational opportunities, such as hunting, fishing, and viewing wildlife.

SRMAs are proposed under all alternatives, though acreage and sites vary. By identifying SRMAs, those areas become a higher priority for recreation management. Designation of SRMAs identifies the recreation management objective, primary recreation activities, and prescribed setting character for each proposed SRMA. Accordingly, the BLM would be able to respond to the need for more intensive management efforts. SRMAs are eligible for construction funding, while Extensive Recreation Management Areas (ERMAs) normally receive less attention for funding. Without

identifying SRMAs, recreational management would be a lower priority, and recreation management actions would be custodial in nature.

The Fort Meade ACEC is proposed for designation as a SRMA under all alternatives. This area has been managed in a coordinated fashion with its ACEC status in the past, and many of the developments (funded by recreation) have improved both the cultural and recreation resources. The 1996 Management Plan describes the recreation management objective, primary recreation activities, and prescribed setting character as "an open undeveloped 'natural island' surrounded by urban development: a place cherished by visitors and the local community for the opportunities it provides to enjoy a variety of outdoor activities in a beautiful natural setting. As such, the Fort Meade Recreation Area ACEC will be managed to protect its historic/cultural sites and associated landscape, to maintain its biodiversity, and to afford educational, interpretive and recreational opportunities to visitors."

Importing of forage for recreation use has the potential to introduce noxious weeds. The BLM would require certified weed free forage, which will eliminate this source of noxious weeds. Surface disturbance from recreation use has the potential to create new beds for weed establishment. The application of BMPs from the Integrated Vegetation Management Handbook would reduce the potential for establishment. Weed treatments may temporarily close or limit the use of recreation facilities. The area and time of closure/limits due to weed treatments are anticipated to be negligible. Recreation use, particularly vehicle travel, has the potential to spread noxious weeds. The current travel management regulations limiting travel to existing roads, future travel management plans incorporating weed concerns, and following the BLM-SDFO 2011 Weed Prevention Schedule would reduce the potential impacts to negligible.

Special Recreation Permits may increase in number and impacts over time. Accordingly, the BLM would be able to respond to the need of establishing threshold levels of issued SRPs based on resource conditions, social and resource user conflict analysis.

Fire Management and Ecology: Surface disturbance from prescribed fire actions would burn vegetation to improve the health of the land but would leave a blackened landscape, increase soil erosion, produce smoke, and add temporary two track suppression roads throughout the treated area. Although this land treatment would have a short-term effect in reducing recreational opportunities and degrading the quality of the recreational experience, the long-term benefits from improving the health of land and its associated improved recreational opportunities and experiences, far outweigh lesser adverse effects from the initial prescribed burn. Prescribed fire would occur throughout the life of the RMP and is prescribed when fuels are within acceptable burning standards. Generally, long-term benefits to improving the health of the land would include improving vegetation composition and wildlife habitat which in turn may improve scenery and should increase recreational opportunities for wildlife viewing, hiking, and hunting.

Surface disturbance from mechanical treatments includes the action of thinning dense stands of trees and would have some of the same effects as prescribed fire. Smoke and blackened trees would be eliminated, but some damage to residual trees would be expected for the short term. Mechanical thinning would occur throughout the planning area, but particularly in the Exemption Area and Fort Meade ACEC. Short-term closures to areas for safety reasons may cause adverse impacts to recreation opportunities.

Forest and Woodland Products: The sale and removal of forest products requires access; therefore, increased road use and possible new road construction would have potential impacts to the recreation resource. Road use and maintenance would be allowed under all alternatives. Increased traffic due to the sale is short-term, lasting three years or less on an intermittent basis. Requirements of timber sale contracts for regular maintenance would reduce dust impacts to short-term, often only days until a treatment is applied to minimize dust concerns. Areas or roads would be temporarily closed to the public during timber sales for safety reasons. Differences among alternatives are negligible.

Lands and Realty: Consolidation of BLM-managed lands would benefit recreation opportunities. Acquiring adjacent lands and public access or disposing of isolated, inaccessible parcels would create a more manageable landscape. The most popular activities (hunting, pleasure driving) are more likely in larger blocks of public land. Conversely, granting ROW easements to utility lines, water lines, and roads help fragment the landscape and adversely impact recreation opportunities. These surface-disturbing actions would cause soil erosion and vegetation loss. Increased traffic, dust, and noise would occur during construction and degrade recreational opportunities and the quality of recreational experiences in and around these activities. These effects would be greatest during the fall hunting season and, to a lesser degree,

during the spring and summer for people who enjoy pleasure driving, hiking, horseback riding, and fishing at developed reservoir sites.

Livestock Grazing: Approximately 271,000 acres of short-term impacts on BLM-administered surface would be available for grazing each year. No long-term acres are projected to be disturbed because of implementation of reclamation activities. In addition to grazing, at least two rangeland improvement projects would be expected each year. These projects include constructing fences, wells, and small reservoirs throughout the planning area. Actual construction of these range improvements would increase soil and vegetation disturbance and possibly fragment the landscape by constructing barriers (fences) to the recreating public. New roads may be created to access range improvements during construction and maintenance. These effects would have low potential for degrading recreational opportunities and experiences where rangeland improvements are constructed. Some reservoirs could increase fishing opportunities where habitat would support stocking fish. These effects would be greatest during the fall hunting season and to a lesser degree during the spring and summer for people who enjoy pleasure driving, hiking, horseback riding, and fishing at developed reservoir sites. Differences among alternatives are negligible.

Minerals – Locatable/Leasable: Approximately 87 acres of short-term disturbance and 9 acres of long-term disturbance on BLM-administered surface are projected to be disturbed by BLM-authorized solid mineral locatable actions over the life of the RMP as a result of reasonably foreseeable development.

Bentonite resources are present in multiple beds in geological formations at the surface in a large portion of the planning area. However, mining has historically occurred in Butte County, north of the Black Hills near Highway 212. Development is likely to slowly move north from that area. The existing processing plant location, hauling costs, and depth to beds are important factors influencing future development. Surface-disturbing actions associated with extracting bentonite would most likely leave small to moderate open pits on the landscape. This activity would also create new roads to access these pits which would cause dust and noise from increased traffic. Where bentonite pits and other disturbances may occur, there would be a loss of recreational opportunities and a decline in the quality of the recreational experience. These recreational effects would primarily occur during the fall hunting season and, to a lesser degree, during spring and summer for people who enjoy pleasure driving, hiking, and fishing. After mineral extraction and reclamation of these pits are complete, adverse effects to recreational opportunities and experiences would be reduced dramatically.

Minerals – Salable: Large scale, commercial salable mineral development is not expected. Activities associated with salable minerals include excavating and processing gravel from small open pits on the landscape throughout the planning area. In addition to extracting and processing gravel in these pits, new access roads would be created which, in turn, would create dust and noise from increased traffic. Although these pits would be smaller than those described for locatable minerals, the effect would be the same, but to a lesser degree. There would be a loss of recreational opportunities and a decline in the quality of the recreational experience where the pits exist. Effects would be greatest during the fall hunting season and, to a lesser degree, during spring and summer for people who enjoy pleasure driving, hiking, horseback riding, and fishing.

Wildlife Habitat: Fish and wildlife-dependent recreational opportunities would increase or decrease in proportion to the overall productivity of habitats. Habitat management resulting in fish and wildlife population increases would increase recreational visitation. Habitat loss in response to allocation of lands and resources to competing industrial development would cause population decreases that, in turn, would decrease recreational visitation.

As a state with a substantial tourism market, nonresident recreationists benefit from South Dakota opportunities, as well as provide economic benefits to the state. Non-resident visitation could be affected by the various alternatives. These impacts are discussed briefly under the individual alternatives.

Impacts under Alternative A (Current Management)

Fire Management and Ecology: Approximately 213 acres of BLM-administered surface are projected to have short-term disturbance from BLM-authorized prescribed fire actions annually. In addition, approximately 346 acres of BLM-administered surface would be disturbed by mechanical treatment actions annually. No long-term acreage is projected to

be disturbed because of reclamation activities and vegetation regrowth. Alternative A identifies the least acreage for fire management and ecology treatments and would have the least potential for adverse impacts on recreation opportunities.

Minerals – Leasable: Approximately 82 acres of long-term disturbance and 49 acres of short-term disturbance are projected to occur on public land by BLM-authorized oil and gas development actions over the life of the RMP. These surface-disturbing actions associated with development of new oil and gas wells would create roads, visual intrusions from natural gas sheds and compressor stations, and cause dust and noise from increased traffic, all reducing recreational opportunities and the quality of recreational experiences. This would occur mostly within the high and moderate potential areas for oil and gas development in Butte and Harding counties and primarily during the fall hunting season. To a lesser degree, this would cause adverse effects during spring and summer for people who enjoy pleasure driving, hiking, horseback riding, and fishing. These recreational effects would continue throughout the life of the RMP or term of the leased wells.

Approximately 6,894 acres of BLM-administered surface would be closed to fluid mineral leasing, and 15,489 acres of BLM-administered would be open subject to NSO. Existing recreational opportunities and respective experiences would be protected from natural gas development surface-disturbing actions throughout the planning area. Effects would be greatest for dispersed recreational opportunities during the fall hunting season and, to a lesser degree, during spring and summer for people who enjoy pleasure driving, hiking, horseback riding, and fishing.

Lands and Realty: Approximately 80,000 acres of small, isolated tracts of public land have been identified for disposal either through land exchange or by sale throughout the planning area. (These tracts are located outside the retention zones shown in Map 2-2). Exchanging BLM land for other lands would most likely have a beneficial effect on recreational opportunities by blocking up existing BLM land or possibly gaining legal access to resource valued isolated BLM land. The sale of BLM land would result in long-term adverse impacts due to the loss of recreational opportunities associated with the specific BLM land.

Approximately 136 acres of long-term disturbance and 79 acres of short-term disturbance are projected to occur on public land by BLM-authorized ROW actions throughout the life of the RMP. ROWs, leases, and permits would be granted to surface-disturbing actions such as utility lines, communications sites, and oil and gas development. These surface-disturbing actions associated with ROWs, leases, and permits would create new roads, visual intrusions from power lines, and communications sites, and would cause dust and noise from increased traffic. This, in turn, would reduce recreational opportunities and the quality of recreational experiences. These effects would occur throughout the planning area, and during spring, summer, and fall for most dispersed recreational opportunities such as hunting, fishing, pleasure driving, and viewing wildlife.

Travel Management: In most of the planning area (264,706 acres, or 97 percent) motorized travel is designated as "limited to existing roads and trails." In the ACECs (6,894 acres, or 3 percent) motorized use is "limited to designated roads and trails." Alternative A benefits the motorized recreational user more than the non-motorized user because of the extensive public land area accessible by motorized use for enjoying dispersed recreational. Although there are small to moderate blocks of public land in between primitive two-track roads that afford the non-motorized recreational user opportunities for solitude from hiking, backpacking, and horseback use, those recreational experiences would be diminished over the long term to a minor degree from dust, noise, and vehicle movement from nearby motorized use.

Recreational Use: Under Alternative A, established protection measures would benefit recreation because of the direct link between recreational use (fishing, hunting, wildlife viewing, and photography) related to these resources. Visitation numbers are greatest during the fall hunting season. OHV use occurs throughout the year and especially during the fall hunting season. During spring and summer, the highest recreation uses are camping, hiking and viewing wildlife. The established protection measures are fewest and least restrictive under Alternative A, which may cause moderate long-term adverse impacts to recreation use.

Recreation Opportunity Spectrum: No Recreation Setting Characteristic objectives have been identified for the planning area. The description of the Middle Country class best fits the majority of the planning area. The identification of a class helps guide future development and provides objectives for recreation settings. The impact of not designating recreation objectives would be a moderate, long-term, adverse effect on recreation potential. The lack of designation leaves development subject to vagueness and conflicts.

Wildlife and Special Status Species: Alternative A includes few prescriptive measures for wildlife habitat protection. With the fewest acres subject to protective measures, the potential exists for adverse impacts to habitat. Recreation use, particularly hunting and wildlife viewing, reflects the quality of wildlife habitat. Approximately 6,894 BLM-administered surface acres would be closed oil and gas development, leasable minerals, and new ROWs. In addition, approximately 15,489 acres of BLM-administered surface acres would be subject to NSO for the above activities. Alternative A would result in 5,522 acres excluded from wind energy development. By comparison, Alternatives B, C, and D would restrict wind energy development on over 180,000 acres of BLM-administered surface. This alternative has the highest potential for adverse impacts to recreation from decreased quality of wildlife habitat.

Impacts under Alternative B

Fire Management and Ecology: Approximately 1,000 acres of BLM-administered surface are projected to be disturbed by BLM-authorized management ignited prescribed fire actions annually. In addition, approximately 400 acres of BLM-administered surface would be disturbed by mechanical treatment actions annually. No long-term acres are projected to be disturbed because of reclamation activities and regrowth of vegetation. Areas may be closed for safety reasons during the term of treatments. Alternative B identifies the most acreage for fire management and ecology treatments and, therefore, has the most potential to adversely affect recreation opportunities in the short term.

Minerals – Leasable: Approximately 65 acres of long-term disturbance and 39 acres of short-term disturbance are projected to occur on public land by BLM-authorized oil and gas development actions over the life of the RMP. These surface-disturbing actions would create new roads, visual intrusions from natural gas sheds and compressor stations, and cause dust and noise from increased traffic, which in turn would reduce recreational opportunities and the quality of the recreational experience. This would occur mostly within the high and moderate potential areas for oil and gas development in Perkins and Harding counties and primarily during the fall hunting season and, to a lesser degree, during spring and summer for people who enjoy pleasure driving, hiking, horseback riding, and fishing. These recreational effects would continue throughout the life of the RMP or term of the leased wells.

Approximately 6,574 acres of BLM-administered surface would be closed to fluid mineral leasing, and 105,837 acres would be open subject to NSO. Existing recreational opportunities and experiences would be protected from natural gas development surface-disturbing actions throughout the planning area on these NSO acres. Effects would be greatest for dispersed recreational opportunities during the fall hunting season and, to a lesser degree, during the spring and summer for people who enjoy pleasure driving, hiking, horseback riding, and fishing.

Lands and Realty: Approximately 80,000 acres of small, isolated tracts of public land throughout the planning area have been identified for disposal either through land exchange or by sale. (These tracts are located outside of the retention zones shown in Map 2-2). Exchanging BLM land for other lands would most likely have a beneficial effect on recreational opportunities by blocking up existing BLM land or possibly gaining legal access to isolated BLM land. The sale of BLM land would result in long-term adverse impacts due to the loss of recreational opportunities associated with specific BLM land.

Approximately 133 acres of long-term disturbance and 77 acres of short-term disturbance are projected to occur on public land by BLM-authorized ROW actions. ROWs, leases, and permits would be granted for surface-disturbing actions such as utility lines, communications sites, and oil and gas development. These surface-disturbing actions associated with ROW leases and permits would create new roads, visual intrusions from power lines, and communications sites, causing dust and noise from increased traffic. This would reduce recreational opportunities and the quality of the recreational experience, causing minor long-term detrimental impacts. These effects would occur throughout the planning area and during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, fishing, pleasure driving, and viewing wildlife.

Travel Management: Potential impacts would be the similar to Alternative A. Due to the emphasis on production, development, and commercial use in this alternative, it is likely more roads would be designated for wheeled motorized travel than in Alternatives C or D. In addition, TMAs (Fort Meade, Exemption Area, and Center of the Nation) would be highest priority for specific travel management decisions, including road closure and route identification. The Exemption Area SRMA would have wheeled motorized and oversnow/snowmobile use limited to designated routes. Limiting vehicle use would have a negligible impact on recreation because terrain and land ownership concerns reduce

access. Oversnow/snowmobile allowable seasonal use would coincide with the state snowmobile trail system in the Exemption Area SRMA. Outside TMAs oversnow/snowmobile use would be open seasonally when there is sufficient snow depth to prelude soil disturbance.

In addition, off-road game retrieval up to 300 feet from an existing road would be allowed during the big game hunting season. Game retrieval would occur between the hours of 10:00 am and 2:00 pm and in a minimum time frame utilizing the shortest route, and avoiding resource damage. Allowing game retrieval will benefit those motorized recreational users who may not have the means or ability to retrieve their down big game by non-motorized use which allows this recreational opportunity and experience to continue for them on BLM land. However, for the non-motorized big game hunter, the encounter of off-road motorized use during their hunt may degrade their hunting opportunity and the quality of that experience. There is also potential that enforcement of this rule may prove to be a challenge for law enforcement.

Additionally, management actions concerning vegetation, water, soil, and fire would enhance fish and wildlife habitats throughout the planning area and preserve the landscape aesthetics for recreation to a greater extent than Alternative A, but less than Alternative C or D. Increased restrictions would further protect resources of interest to the recreating public. Because BLM land would be managed for watershed stability, wildlife habitat, and dispersed recreational considerations, beneficial long-term impacts to recreation would occur. Visitation may potentially increase due to the SRMA designation of the Exemption Area and the subsequent development, maintenance, and signing of recreation facilities. Managed increased recreation opportunities would be a beneficial long-term moderate impact to recreation use.

Recreation Setting Characteristics: The RSC classes characterize recreation components in each class in terms of setting, activity, and experience. Alternative B identifies 320 acres (Fossil Cycad ACEC) for Back Country characteristics. A majority of the planning area, approximately 261,325 acres (95 percent) would be managed to achieve Middle Country characteristics. The Exemption Area and Fort Meade ACEC (11,652 acres) would be managed for Front Country characteristics. Alternative B favors recreation that needs or is compatible with motorized accessibility. Motorized travel would still be limited to existing roads and trails. Non-motorized recreation would not be emphasized; however, it would be available between roads or in areas adjacent to walk in where OHV travel may or may not be allowed.

Special Recreation Management Areas: The BLM-managed acres of the Exemption Area would be designated and managed as a SRMA. Public land adjacent to the communities of Deadwood and Lead would be managed for access to other public lands (Black Hills National Forest). OHV access on designated routes would be emphasized, including development, maintenance and signing. Motorized access systems would be coordinated with communities and the Black Hills National Forest. Non-motorized recreation in the form of hiking trails may be developed in coordination with the communities. Day use recreation opportunities would be emphasized, and overnight use would not be developed due to the proximity to private campgrounds and community amenities. Alternatives B and D both designate the Exemption Area as a SRMA. Increased emphasis on recreation would not have a major adverse impact on other uses. Livestock grazing and management would still be allowed, though gates and crossings may need design modification to be compatible with trail use. Treatments to reduce wildfire risk and restore ecological conditions would not be affected. Forest product use would still be available, though trails may be closed or rerouted for safety reasons. Surface occupancy and use for oil and gas would be prohibited within 1/2 mile of this new SRMA. Although technically a new restriction, the area shows low potential for fluid mineral development. OHV use would be limited to existing roads and trails until travel management area plans designate roads. Design, maintenance, and connectivity would be better managed. The RSC class would be Front Country, allowing for increased development and controls. The VRM class would be Class 4, also allowing for increased development of OHV roads and trails (vehicle and pedestrian). Lands and Realty proposals that consolidate and improve management for BLM lands would be allowed, and any "new" BLM lands may be incorporated into the SRMA designation. Exchange for SRMA parcels would be allowed for this consolidation. Realty proposals for ROW would consider impacts on SRMA values.

Wildlife and Special Status Species: Approximately 6,574 BLM-administered surface acres would be closed to oil and gas development and leasable minerals. In addition, approximately 105,837 acres of BLM-administered surface would be subject to NSO. Alternative B would place avoidance restrictions on wind energy development and other ROWs on 189,153 acres. The excluded acres would eliminate surface-disturbing actions and infrastructure developments (roads, wind turbines, power lines), which would maintain and/or enhance wildlife habitat and, in turn, provide a beneficial effect on dispersed recreational opportunities and quality of the recreational experience. Eliminating these surface-

disturbing actions maintains the existing condition of the soil and vegetation resources and protects the existing scenic quality. Protective measures that enhance wildlife habitat would increase populations of wildlife and improve dispersed recreational opportunities. These effects would occur throughout the planning area and during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, fishing, pleasure driving, and viewing wildlife.

Impacts under Alternative C

Fire Management and Ecology: Approximately 500 acres of BLM-administered surface are projected to be disturbed by BLM-authorized prescribed fire actions annually. In addition, approximately 350 acres on BLM-administered surface are projected to be disturbed annually by mechanical treatment actions. No long-term acres are projected to be disturbed because of reclamation activities and regrowth of vegetation. Alternative C identifies more acres of treatment than Alternative A, but less than Alternative B, potential short-term impacts to recreation opportunities are minor.

Minerals – Leasable: Approximately 63 acres of long-term disturbance and 38 acres of short-term disturbance are projected to occur on public land by BLM-authorized oil and gas development actions over the life of the RMP. These surface-disturbing activities would result in the same effects as in Alternative A.

Approximately 100,160 acres of BLM-administered surface would be closed to fluid mineral leasing, and 43,290 acres would be open subject to NSO. Existing recreational opportunities and their respective experiences would be protected from natural gas development surface-disturbing actions throughout the planning area. Effects would be greatest for dispersed recreational opportunities during the fall hunting season and to a lesser degree during the spring and summer for people who enjoy pleasure driving, hiking, horseback riding and fishing.

Lands and Realty: Approximately 80,000 acres of small, isolated tracts of public land have been identified for disposal either through land exchange or by sale throughout the planning area. Impacts would be the same as those described in Alternative A.

Approximately 88 acres of long-term disturbance and 51 acres of short-term disturbance are projected to occur on public land by BLM-authorized ROW actions throughout the life of the RMP. Alternative C would have the fewest acres disturbed, resulting in the fewest detrimental impacts to recreation use. The disturbance would cause minor long-term adverse impacts. No long-term acres are projected to be disturbed because of implementation of reclamation activities. ROWs, leases and permits would be granted for surface-disturbing actions such as utility lines, communications sites, and oil and natural gas development. These surface-disturbing actions associated with ROW leases and permits would create new roads, visual intrusions from power lines, and communications sites, and cause dust and noise from increased traffic, which in turn would reduce recreational opportunities and the quality of the recreational experience. These effects would occur throughout the planning area and during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, fishing, pleasure driving, and viewing wildlife.

Travel Management: Alternative C designates 143,528 acres (53 percent) for OHV use limited to existing roads and trails, and 128,224 acres (47 percent) as limited to designated roads and trails. Big game retrieval is not authorized under this alternative.

TMAs would be designated the same as Alternative B, and prioritization would be the same as under Alternatives B. However, due to the conservation theme of this alternative, it is likely that travel management decisions and limitations noted above, would result in fewer motorized recreation opportunities than in any of the other alternatives. The impact would be moderate because habitual or cultural methods of accessing interior public land may be threatened. The impact of travel regulations would be long-term, because it would guide access in the future.

Recreational Use: Under Alternative C, established protection measures benefit recreation because of the direct link between recreational use (fishing, hunting, wildlife viewing) related to these resources. Since these protection measures are greater in Alternative C than in any other alternative, there is less potential for adverse impact.

Additionally, management actions concerning vegetation, water, soil, and fire would enhance fish and wildlife habitats throughout the planning area and preserve the landscape aesthetics for recreation to a greater extent than under any other alternative. Increased restrictions would further protect resources of interest. Because BLM land would be managed for

watershed stability, wildlife habitat, and dispersed recreational considerations, beneficial long-term impacts to recreation would occur.

Recreation Setting Characteristics: This alternative proposes the most acres (178,163) be managed for Back Country characteristics. Approximately 88,539 acres would be managed for Middle Country characteristics. The Fort Meade ACEC (6,574 acres) would be managed for Front Country characteristics. This alternative would favor more non-motorized recreation opportunities over motorized recreation. The impacts would be moderate and long-term because of the change to a non-motorized emphasis.

Special Recreation Management Areas: No additional areas would be identified for recreation emphasis. This does not eliminate the possibility of future recreation development, but the funding and long-term vision for the recreation setting would not be a management priority.

Wildlife and Special Status Species: Approximately 100,160 BLM-administered surface acres would be closed oil and gas development, and 100,970 acres closed for leasable minerals. In addition, approximately 43,897 acres of BLM-administered surface would be subject to NSO. Alternative C would not allow wind energy development and other ROWs on 199,420 acres through exclusion restrictions. The excluded acres would eliminate surface-disturbing actions and infrastructure developments (roads, wind turbines, power lines), which would maintain and/or enhance wildlife habitat and, in turn, provide a beneficial effect on dispersed recreational opportunities and the quality of the recreational experience. Eliminating these surface-disturbing actions would maintain the existing condition of the soil and vegetation resources and protect existing scenic quality. Protective measures that enhance wildlife habitat would increase populations of wildlife and improve dispersed recreational opportunities. These effects would occur throughout the planning area and during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, fishing, pleasure driving, and viewing wildlife.

Special Designations: An ACEC designation in Greater Sage-Grouse PPAs areas as shown in Figure 2-1 and Map 2-5 may result in a slight increase in visitor use as a result of the increased attention to these areas from the designation. Recreational management would not likely differ to a large degree in the ACEC as the intermingled pattern of land ownership in the PPA makes ACEC specific recreation management actions difficult to implement.

Impacts under Alternative D (Preferred Alternative)

Fire Management and Ecology: Impacts would be the same as Alternative B.

Minerals – Leasable: Impacts would be the same as those described in Alternative B.

Approximately 6,894 BLM-administered surface acres would be closed to fluid mineral leasing, and 107,025 acres would be open subject to NSO. Existing recreational opportunities and experiences would be protected from natural gas development surface-disturbing actions throughout the planning area on these NSO acres. The effects would be greatest for dispersed recreational opportunities during the fall hunting season and to a lesser degree during the spring and summer for publics who enjoy pleasure driving, hiking, horseback riding and fishing at developed reservoir sites.

Lands and Realty: Approximately 80,000 acres of small, isolated tracts of public land have been identified for disposal either through land exchange or by sale throughout the planning area. This is the same as Alternative B.

Gaining legal access to resource valued BLM land would increase dispersed recreational opportunities for the recreating public, especially during the fall hunting season and, to a lesser degree, during the spring and summer for people who enjoy pleasure driving, fishing, and viewing wildlife.

No long-term acres are projected to be disturbed because of implementation of reclamation activities. ROWs, leases and permits would be granted for surface-disturbing actions such as utility lines, communications sites, and oil and natural gas development. These surface-disturbing actions associated with ROW leases and permits would create new roads, visual intrusions from power lines, and communications sites, and cause dust and noise from increased traffic, which in turn would reduce recreational opportunities and the quality of the recreational experience. These effects would occur

throughout the planning area and during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, fishing, pleasure driving, and viewing wildlife.

Travel Management: OHV use is limited to existing roads and trails on 97 percent of the planning area and limited to designated roads and trails on 3 percent (the same as Alternative A), and the effects would be the same.

Three TMAs, the Fort Meade ACEC, Exemption Area, and Center of the Nation, would be highest priority for specific travel management decisions, including road closure and route identification. Due to the emphasis on production, development, and commercial use in this alternative, it is likely more roads would be designated for wheeled motorized travel than in Alternative C.

Off-road game retrieval using vehicles would not be allowed during the big game hunting season on BLM lands. This is consistent with adjacent state and Forest Service lands.

Recreational Use: Managing certain resources could influence recreational use patterns, opportunities, and preferences within the planning area to a limited extent. For example, current management actions for oil and gas development affect vegetation, water, and soil, and are anticipated to influence the distribution of fish and wildlife throughout the planning area, thereby influencing recreational use. Increases in fish and wildlife populations from stipulating protective measures on their habitats for oil and natural gas development translates to increased recreational opportunities, such as hunting, fishing, and viewing wildlife.

Additionally, management actions concerning vegetation, water, soil, and fire would enhance fish and wildlife habitats throughout the planning area and preserve the landscape aesthetics for recreation to a greater extent than Alternative A, but less than Alternative C or D. The increased restrictions would further protect resources of interest to the recreating public. Because BLM land would be managed for watershed stability, wildlife habitat, and dispersed recreational considerations, beneficial long-term impacts to recreation would occur. Visitation may potentially increase due to the SRMA designation of the Exemption Area and the subsequent development, maintenance, and signing of recreation facilities.

Recreation Setting Characteristics: The RSC classes characterize the recreation opportunities in each class in terms of physical, operational, and management components. This alternative identifies 320 acres (Fossil Cycad ACEC) for Back Country characteristics. The majority of the planning area, approximately 261,325 acres (95 percent) would be managed to achieve Middle Country characteristics. However, this alternative also suggests that BLM lands adjacent to state walk-in areas would have consistent travel limitations. While those acres and areas change year by year, the current acreage would be representative. Up to 101,617 BLM acres would have designated roads in conjunction with walk-in areas. The Exemption Area and Fort Meade ACEC (11,652 acres) would be managed for Front Country characteristics. Alternative D favors recreation that needs or is compatible with motorized accessibility. Motorized travel would still be limited to existing roads and trails. Non-motorized recreation would not be emphasized in the planning area, however, it would be available between roads or in areas adjacent to walk-in areas where OHV travel may or may not be allowed.

Special Recreation Management Areas: BLM-managed acreage in the Exemption Area would be designated and managed as a SRMA. The public acres adjacent to the communities of Deadwood and Lead would be managed for access to other public lands (Black Hills National Forest). OHV access on designated routes would be emphasized, including development, maintenance and signing. Motorized access systems would be coordinated with communities and the Black Hills National Forest. Non-motorized recreation in the form of hiking and biking trails may be developed in coordination with the communities. Day use recreation opportunities would be emphasized, overnight use would not be developed due to the proximity to private campgrounds and community amenities. Alternatives B and D both designate the Exemption Area SRMA. The increased emphasis on recreation would not have a major impact on other uses, although it does not preclude development of other, often competing resources. Livestock grazing and management would still be allowed, although gates and crossings may need design modification to be compatible with trail use. Treatments to reduce wildfire risk and restore ecological conditions would not be affected. Forest product use would still be available, although trails may be closed or rerouted for safety reasons. Surface occupancy and use for oil and gas would be prohibited within ½ mile of this new SRMA. Although technically a new restriction, the area shows low potential for fluid mineral development. OHV travel would be limited to existing roads and trails until travel management area plans designate roads. Design, maintenance, and connectivity would be better managed. The RSC class would be Front Country, allowing for increased development and controls. The VRM class would be Class 3,

which is moderately restrictive for development including OHV roads and trails (vehicle and pedestrian). Lands and Realty proposals that consolidate and improve management for BLM lands would be allowed, and any "new" BLM lands may be incorporated into the SRMA designation. Exchange for SRMA parcels would be allowed for this consolidation. Realty proposals for ROWs would consider the impacts on the SRMA values.

Wildlife and Special Status Species: Approximately 6,894 BLM-administered surface acres would be closed to oil and gas development and leasable minerals. In addition, approximately 107,025 acres of BLM-administered surface acres would be subject to NSO for those activities. Alternative C would exclude wind energy development on 118,904 acres, and avoid development on 78,636 acres. The excluded acres would eliminate surface-disturbing actions and infrastructure developments (roads, wind turbines, power lines) from the above activities, which would maintain and/or enhance wildlife habitat and, in turn, provide a beneficial effect on dispersed recreational opportunities and the quality of the recreational experience. Eliminating these surface-disturbing actions would maintain the existing condition of soil and vegetation resources and protect the existing scenic quality. Protective measures that enhance wildlife habitat would increase populations of wildlife and improve the dispersed recreational opportunities. These effects would occur throughout the planning area and during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, fishing, pleasure driving, and viewing wildlife.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present actions that affect and have affected recreational opportunities and the quality of the recreational experience include mineral exploration and development, Lands and Realty surface-disturbing ROWs, with some minor impact from livestock grazing and vegetation treatments. In general, these actions have all had cumulative adverse impacts on recreational opportunities and experiences by creating new roads and visual intrusions on the landscape which cause soil erosion, vegetation loss, and fragmentation of landscapes. Beneficial impacts would include easier access from road construction and any improvements funded through recreation emphasis. RFD actions in the planning area and on federal, state, private, and other lands within and adjacent to the planning area that could adversely impact recreation opportunities and experiences, include ongoing mineral exploration, development, and production; and renewable energy development.

Cumulative Impacts under Alternative A (Current Management)

The combined impact of other uses such as grazing, infrastructure associated with grazing, and use of the existing roads as a shortcut to other locations would result in a minor adverse impact to recreational experiences.

Cumulative Impacts under Alternative B

Cumulative impacts would be much the same as in Alternative A. However, because established protection measures for soil, water, vegetation and wildlife resources are similar, but somewhat more relaxed than in Alternative C, and because of increased recreation emphasis in the Exemption Area, the total cumulative impact to recreation opportunities and experiences would be the highest of all alternatives.

Cumulative Impacts under Alternative C

Because the established protection measures for soil, water, vegetation and wildlife resources are greater in Alternative C than in any other alternative, the total cumulative impact to recreation opportunities and experiences would be the lowest of all alternatives.

Cumulative Impacts under Alternative D (Preferred Alternative)

Established protection measures for soil, water, vegetation and wildlife (restrictions) resources cover less acreage than Alternative C, but more than Alternatives A or B. Adverse impacts to recreation experience and use would more likely occur in Alternative D than in Alternative C, but less likely than in Alternatives A or B. However, specific measures in

Alternative D (SRMA designations and VRM classifications) identify and emphasize components that would positively impact the recreation resource.

Travel Management

The following section describes the effects of each alternative on travel and OHV use. Proposed TMAs are the Fort Meade ACEC (Figure 2-1), Exemption Area (Figure 2-3), and Center of the Nation (Map 2-1). TMAs are polygons or delineated areas where travel management (either motorized or non-motorized) requires particular focus. These areas may be designated as open, closed, or limited to motorized use and typically have an identified or designated network of roads, trails, ways, and other routes that provide for public access and travel across the planning area. All designated travel routes within TMAs should have a clearly identified need and purpose as well as clearly defined activity types, modes of travel, and seasons or times for allowable access or other limitations.

Assumptions

Methods and assumptions used in this analysis include the following:

Visitor use and demand is likely to continue to increase for both motorized as well as non-motorized users. OHV use will remain highest throughout the planning area during antelope and deer rifle seasons.

Demand for adequate public and agency access to public lands will remain high over the life of the RMP.

OHV use is motorized vehicle use of the non-highway road and trail network on public lands. It includes all resource-related activities, including recreation and those activities associated with livestock grazing and mineral development.

A detailed travel plan that addresses all aspects of travel management will be initiated two to five years after the signing of the Record of Decision for this RMP/EIS.

Recreational OHV use is highest within large blocks of public land with legal access and with special resource values such as those associated with hunting and fishing.

Within all TMAs, OHV area designations will be “Limited,” which is defined as areas or trails where the BLM must restrict OHV use to either existing roads and trails or designated roads and trails in order to meet specific resource management objectives. These limitations may include the following: limiting the time, number or types of vehicles, limiting the time or season of use, permitted, licensed use only, limiting use to existing roads and trails, and limiting use to designated roads and trails. The BLM may impose additional limitations, as necessary, to protect other resources, particularly in areas that OHV enthusiasts use intensely or where they participate in competitive events.

OHV travel would continue to be restricted to existing roads and trails after the Record of Decision is signed. After the Record of Decision is signed, a detailed travel plan will be completed and a decision will be made regarding specific aspects of travel management, including restriction of vehicles to roads and trails. Signs and barriers will be utilized to close specific roads or areas, in the interim period between the signing of the ROD and the completion of a detailed travel plan, when circumstances and events cause the following concerns:

- considerable adverse effects on public land resources;
- considerable nuisance or threats to public safety; or
- major use or user conflicts.

TMAs have been identified, but no site-specific route designations will be made in this RMP; therefore, travel and transportation management plans that define designated motorized and non-motorized transportation networks will be developed after the completion of this RMP.

The following assumptions are made before any site-specific travel management planning can occur:

Inventory and road condition assessments will be completed for each TMA prior to travel management planning.

Known legal access needs for easements to BLM lands will be identified.

Baseline road inventory maps will be printed and made available to the general public for their review utilizing open houses, etc.

Allowable uses and management actions with the potential to affect OHV use primarily include land use designations and restrictions. Effects are described in two ways: the effect a particular designation has on OHV use, and the effect OHV use has on lands due to a particular designation.

All alternatives designate areas within the planning area that will be closed, limited to existing roads and trails, or limited to designated roads and trails.

Under this designation "Limited to Existing Roads and Trails," unauthorized user-created roads and trails would continue to add to the number and miles of motor vehicle routes already in existence on public lands. No complete inventory of roads exists, making it difficult for the BLM to determine what existed at the time of the RMP decision. A new set of vehicle tracks is often confused with an "existing" road and as these tracks attract use, and new roads are made. Accordingly, the road system continues to grow. Neither public access nor OHV opportunities would be diminished by this designation.

Under the designation "Limited to Designated Roads and Trails," the incremental growth of unauthorized user-created roads and trails would be curtailed, as would unauthorized OHV use. OHV use would be limited to a specific, designated network of roads and trails. Such a limitation would be beneficial to soils and limit the spread of invasive, non-native plant species (INPS), but would have no effect on commercial or industrial uses of public lands because roads necessary to facilitate those uses are handled under permits or authorizations. This designation would not affect public access, nor would it diminish OHV opportunities. Further, it would have no effect on other resource uses, such as mineral development, because under such a designation, access roads are authorized as needed. Authorized users, lessees, or emergency or law enforcement would be allowed off the designated roads and trails to perform their management or duty functions.

Renewable energy development such as wind farms would result in an increase in permanent roads in areas that are developed. The increase in roads would increase access to public lands and the amount of travel use. The majority of permanent roads that are developed would be open to the public. The size of the development would influence the amount of roads created; however, many other factors such as terrain, project location, restrictions, existing road infrastructure in a given area, etc. would influence the amount of roads needed for renewable energy projects. Impacts provided by alternative are based on the amount of areas open, closed, or avoided under renewable energy ROW restrictions and the amount of development expected under each alternative.

Common impacts to travel management include the following:

Protection of important cultural and/or paleontological sites and the preservation of Native American Traditional Practices may close or relocate roads, thereby affecting OHV use.

Actions conducted for fish and wildlife management could affect OHV use. These actions may include habitat restoration and relocating or closing roads or trails, which may temporarily or permanently affect routes available for OHV use.

Recreation management actions could affect OHV use and management. Promoting use and visitation could increase OHV use and could affect road and trail conditions.

Protection of critical habitat for special status animal and plant species may permanently or seasonally affect the location and use of roads and trails, thereby affecting OHV use.

Water Resources management calls for the use of BMPs and proper floodplain management and/or function to protect water quality. Water Resources management may limit or restrict OHV use where water quality could be or would be impaired by runoff from roads and trails.

Impacts Common to All Alternatives

The following effects to OHV use are common to all alternatives and most likely would occur from implementing travel management planning decisions after the Record of Decision for this RMP. However, some of these effects may occur prior to travel management planning if significant adverse effects on public land resources occur.

The two ACEC areas in the SDFO would remain closed to motorized travel except on designated graveled and maintained roads. The Fossil Cycad ACEC has no trails. The Fort Meade ACEC has the Backcountry Byway, the Ball Diamond/Hooper Road (Cypress Lane) and access roads to the Fort Meade Reservoir and the campgrounds. The Phil Town Road (Old Stone Road) would be open each year for two weeks during the Sturgis Motorcycle Rally to facilitate travel for workers at the Veterans Affairs Hospital and as a bypass for emergency vehicles around rally traffic.

Allowing cross-country travel for leaseholders and disabled hunters can result in the proliferation of roads. On occasion, repeated use of a route in an unroaded area may result in distinct ruts or depressions in the ground that are later used by other members of the public. Eventually the public assumes the route is a two-track road.

The presence of weeds on public land will not increase significantly by implementing any of the alternatives; however, there are different risks associated with each Alternative. A separate travel management plan will be developed for the SDFO after finalization of this RMP. The travel management plan would identify access needs and designate the roads and trails within the proposed TMAs and some other roads and trails within the planning area. The travel management planning may eliminate some redundant roads and trails, thereby reducing the potential for resource damage including the spreading of weeds. It would also make weed management easier to accomplish through improved coordination of travel use and increased public education about factors that increase the spread or introduction of weeds.

Impacts under Alternative A (Current Management)

Alternative A continues current OHV use designations with travel limited to existing roads and trails and the Fort Meade ACEC having no OHV use other than on maintained roads and trails. No Travel Management Areas (TMAs) would be designated in Alternative A. If TMAs are not used, travel management in the areas used the heaviest including the western portion of Butte County, the Fort Meade ACEC and the Exemption Area may become less orderly as recreation and other types of uses increases over time. The end result would be an increase in the amount of two-track roads and trails with an increase in multiple routes going to the same place. As travel use increases over time, new roads and trails would become established in a haphazard fashion, often in areas that are susceptible to erosion or other resource impacts.

Fluid Minerals – Leasable: Under Alternative A, the amount of oil and gas development would be the second highest authorized on BLM lands of all the alternatives. With development, new roads are constructed to access new oil and gas well sites and could affect vehicle use patterns. Increased road construction would create more OHV access to public lands but users may avoid these areas when operations are occurring, displacing them to other areas. These effects would occur mostly within the moderate potential areas for oil and gas development in Butte and Harding counties and continue throughout the life of the plan.

Lands and Realty

Land Tenure: Approximately 80,000 acres of small isolated tracts of public land have been identified for disposal either through land exchange or by sale throughout the planning area. Exchanging public lands for other lands most likely will have a beneficial effect on OHV use by blocking up existing public lands which would make available a larger area for OHV use and/or possibly gaining legal access to resource valued isolated public lands. The sale of public lands will result in the loss of OHV use associated with those specific public lands sold.

Access: The goal of obtaining legal access or additional legal access to large blocks of BLM-administered lands through private land easements was mentioned in the previous SD RMP. Gaining legal access to resource valued

public lands would make available more public land for OHV use for the recreating public, especially during the fall hunting season, and to a lesser degree during the spring and summer for publics who enjoy pleasure driving, and viewing wildlife.

Rights-of-Way, Leases and Permits: Approximately 136 acres of short-term disturbance is expected and 79 acres of long-term disturbance is expected in the under Alternative A. ROWs, leases and permits would be granted for surface-disturbing actions such as utility lines, communications sites, oil and natural gas development, and wind farms. These surface-disturbing actions associated with ROWs, leases and permits would create new roads and thereby may increase OHV access to public lands. These effects would occur throughout the planning area and make available more public land for OHV use during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, pleasure driving, and viewing wildlife.

OHV Use and Travel Management Areas: Motorized vehicle travel off an existing road or trail to retrieve game would not be allowed. Motorized vehicle travel off an existing road or trail for up to 300 feet would be allowed to establish a campsite. No restrictions would be placed on snowmobiles.

This alternative would have little effect on the volume of OHV use either in the short or long term. Because of the designation's nature, some degree of unauthorized road proliferation would continue primarily in areas limited to existing roads and trails. Currently, as per the Off-Highway Vehicle ROD (BLM 2003), motorized wheeled cross-country travel for big game retrieval is not allowed, but through subsequent site-specific travel management planning, options for big game retrieval could be considered.

Designating priority areas for travel management planning, identifies areas in need of resolving conflicts between motorized and non-motorized users, and/or conflicts with travel management recreational users creating natural resource management concerns. From scoping and interdisciplinary discussions, three locations were identified as possible subsequent TMAs:

- Fort Meade Recreational Area ACEC;
- Exemption Area (BLM-administered surface estate in the Lead /Deadwood Area); and
- Center of the Nation (BLM-administered surface estate in Northern Butte County and Southern Harding County).

To date, no site-specific travel management planning has occurred for any of the above areas as baseline road network inventories are still in progress. The potential travel management planning areas listed above are preliminary; additional TMAs could be identified through the travel planning process.

Renewable Energy: Alternative A would result in the highest level of renewable energy development. This type of development would result in an increase in road density within and near development areas. The potential for increased travel use as a result of renewable energy development would be the highest under this alternative.

Impacts under Alternative B

Under Alternatives B, C and D, the following TMAs would be used for travel management planning after the Record of Decision for the RMP: Center of the Nation in western Butte County and southern portions of Harding County (Map 2-1); the Fort Meade ACEC in Meade County (Figure 2-1); and the Exemption Area in Lawrence County Figure 2-3).

Under Alternative B, OHV travel in the Fort Meade ACEC would be limited to maintained roads and trails, and a travel management plan for the whole planning area would be developed over the next five years. This alternative has the least acreage in higher VRM classes, so placement of developments and facilities would be less restrictive. Additional access roads associated with commercial development would make once remote locations more accessible to OHVs.

This alternative offers the most areas and acreage of all the alternatives for off-road vehicles, all-terrain vehicles, motorcycles, and other specialized off-road vehicles, which would benefit those specific OHV users.

Fluid Minerals – Leasable: Under Alternative B, the amount of commercial use authorized on BLM land would be the highest of all the alternatives. With development, new roads would be constructed to access new oil and gas well sites which could affect vehicle use patterns. Increased road construction would create more OHV access to public lands but users may avoid these areas when operations were occurring, displacing them to other areas. Effects would occur mostly within the moderate/high potential area for oil and gas development (Center of the Nation area) and continue throughout the life of the RMP.

Lands and Realty

Land Tenure: Approximately 80,000 acres of small isolated tracts of public land have been identified for disposal either through land exchange or by sale throughout the planning area. Exchanging public lands for other lands most likely would have a beneficial effect on OHV use by blocking up existing public lands which would make available a larger area for OHV use and/or possibly gaining legal access to resource valued isolated public lands. The sale of public lands would result in the loss of OHV use associated with those specific public lands sold.

Access, Rights-of-Way, Leases and Permits: Impacts would be the same as under Alternative A.

OHV Use and Travel Management Areas: Single, round trip off-road travel for game retrieval would be allowed during the big game hunting season on all BLM lands within 300 feet of existing roads and trail in the planning area except within the Fort Meade ACEC.

Under this alternative camping would be allowed within 300 feet of an existing road or trail by the most direct route unless restricted by terrain obstacles.

Travel would be unrestricted for snowmobiles and vehicles equipped for snow travel unless monitoring detects environmental degradation. This would maximize opportunities for winter travel, especially in portions of the planning area that are located on the prairie, where terrain and vegetation types favor the use of cross-country travel by snowmobiles or vehicles equipped for snow travel.

Fort Meade ACEC: While the ACEC is proposed to remain closed to motorized travel off its designated roads and ROWs, management actions are proposed to establish and maintain a system of hiking, biking, and horseback trails with partnership groups assisting in planning and maintenance. Most of the trails already exist and are receiving casual use or are routes used in special events. About 22 miles of trail would be involved. Establishment of formal marked trails would increase visitor use of the ACEC. Fort Meade is easily accessible from I-90 and its trail system would have a longer season of use for the public than those in the Black Hills National Forest.

The Fort Meade Backcountry Byway is the only connecting route from I-90 to State Highway 34. It is driven by about 33,000 motor vehicles per year and has steady increase as Sturgis develops to its east. The heaviest period of traffic is around the Sturgis Motorcycle Rally in August. The Byway can be closed for up to six months a year due to weather and unsafe road conditions. It is also closed during special events when motor vehicle presence would cause safety concerns with event participants and spectators. There would be no new roads for motorized vehicles on Fort Meade ACEC, but existing authorized roads may be realigned reduce the impact to resources or for public safety.

Commercial venues and housing developments have increased urbanization, especially along I-90 and State 34 corridors. There would be an additional travel on the Byway during good weather and more public use of the Fort Meade ACEC's recreation facilities and trails throughout the term of this RMP.

Exemption Area: Scoping did not identify that the Exemption Area is a primary use area for OHV users, but if its trail network was developed it would offer access from the towns of Lead and Deadwood to OHV trails on the Black Hills National Forest. In this alternative the BLM would work with user partnerships and the towns to develop OHV trails and non-motorized trails for hikers, bicyclists, and horseback riders. Combination of motorized trails and non-motorized trails totaling about fifteen miles would be developed and maintained.

Another aspect unique to the Exemption Area is snowmobile trails. Presently the SDGFP maintains a snowmobile trail system with its core route based on the Michelson Trail which crosses some BLM-administered lands. In this alternative

the BLM would partner with user groups, local entities, and the state to increase the amount of snowmobile use on public lands.

Center of the Nation: Travel management planning would move travel from existing roads and trails to designated roads and trails. Roads that are redundant would be closed, and roads impacting resources would be rerouted. Temporary roads built for a project would be decommissioned after project completion. This TMA receives the greatest amount of use during the fall hunting season and also has the largest acreage as a walk-in area. The BLM would work cooperatively with the SDGFP on designated access routes to prevent conflicts between the walk-in areas and OHV travel adjoining BLM-administered lands.

Planning Area: The policy use of existing roads and trails would remain in effect unless their present locations are causing damage to cultural or natural resources. The area near the confluence of the Belle Fourche and Cheyenne rivers has the poorest access to large tracts of BLM-administered land. A goal for travel management in this area, known as Two Rivers, would be to increase motorized and non-motorized access through easements and the use of new and existing trails.

Renewable Energy: Alternative B would result in lower levels of renewable energy development compared to Alternative A or D. This level of development would result in an increase in road density and travel use within and near developed areas but at lesser levels that under Alternative A or D. Under Alternative B, renewable energy development and associated roads would be higher than Alternative C.

Impacts under Alternative C

Designating priority areas for travel management planning, identifies areas in need of resolving conflicts between motorized and non-motorized users and/or conflicts with travel management recreational users creating natural resource management concerns. Under Alternatives B, C and D, the following TMAs would be used for travel management planning after the Record of Decision for the RMP: Center of the Nation in western Butte County and southern portions of Harding County (Map 2-1); the Fort Meade ACEC in Meade County (Figure 2-1); and the Exemption Area in Lawrence County Figure 2-3).

Fluid Minerals – Leasable: Under Alternative C, the amount of oil and gas development would be the lowest authorized on BLM lands of all the alternatives. With development, new roads are constructed to access new oil and gas well sites and could affect vehicle use patterns. Increased road construction would create more OHV access to public lands, but users may avoid these areas when operations are occurring, displacing them to other areas. These effects would occur mostly within the moderate potential areas for oil and gas development in Butte and Harding counties and continue throughout the life of the RMP.

Lands and Realty

Land Ownership: Approximately 80,000 acres of small isolated tracts of public land have been identified for disposal either through land exchange or by sale throughout the planning area. Exchanging public lands for other lands most likely would have a beneficial effect on OHV use by blocking up existing public lands which would make available a larger area for OHV use and/or possibly gaining legal access to resource valued isolated public lands. The sale of public lands would result in the loss of OHV use associated with those specific public lands sold.

Access: The BLM would attempt to acquire public access easements where no legal public access exists or where additional access is needed to meet management objectives. Gaining legal access to resource valued public lands will make available more public land for OHV use for the recreating public, especially during the fall hunting season and to a lesser degree during the spring and summer for publics who enjoy pleasure driving, and viewing wildlife.

Rights-of-Way, Leases and Permits: Approximately 88 acres of short-term disturbance and 51 acres of long-term disturbance are expected under Alternative C throughout the life of the RMP. No long-term acres are projected to be disturbed because of implementation of reclamation activities. ROWs, leases and permits would be granted for surface-disturbing actions such as utility lines, communications sites, oil and natural gas development, and wind farms. These surface-disturbing actions associated with ROWs, leases and permits would create new roads and thereby may increase OHV access to public lands. These effects would occur throughout the planning area and make available more

public land for OHV use during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, pleasure driving, and viewing wildlife.

OHV Use and Travel Management Areas: The primary changes in OHV designations from Alternative B to Alternative C are that no off-road game retrieval is allowed or would be considered during travel management planning in this alternative; the distance from an existing road or trail would be 100 feet by the most direct route unless restricted by terrain; and snowmobiles or vehicles equipped for snow travel would be restricted to existing roads and trails.

Designating priority areas for travel management planning, identifies areas in need of resolving conflicts between motorized and non-motorized users, and/or conflicts with travel management recreational users creating natural resource management concerns. The following travel management areas are prioritized into the following categories for travel management planning after the Record of Decision for the RMP:

Fort Meade ACEC: Under this alternative the mileage of marked and maintained non-motorized trails would be reduced from 22 miles to 16 miles. Also some trails would be designated as to a primary use such as mountain bike or horseback riding. Trails which are unnecessary or impacting cultural or natural resources would be closed or rerouted. Motorized trails may be rerouted to lessen the impact on resources.

Exemption Area: OHVs would be restricted to designated roads and trails. No new hiking trails will be developed. Snowmobiles would be restricted to the Michelson Trail between the Deadwood and Dumont Trailheads and to other designated locations in the SDGFP-managed snowmobile trail system.

Center of the Nation: This alternative has the largest acreage in higher VRM classes in the area with the largest amount of BLM-administered lands. Travel planning would eventually move this TMA from existing roads and trails to designated roads and trails. This alternative would restrict the road network even more by eliminating unnecessary roads and closing rather than rerouting existing roads which are causing resource damage. Building temporary roads would take place only if their construction was required by law, regulation or policy and then only to minimum standard necessary. Roads would be decommissioned if the project was terminated.

Planning Area: Through travel planning, designate roads and trails on the remaining larger tracts of public land and close roads which are impacting resources. Easements would be obtained to access blocks of public land. Motorized and non-motorized roads and trails would be built and maintained to the minimum standards to assure public access.

Renewable Energy: Alternative C would result in the lowest levels of renewable energy development and associated roads compared to the other Alternatives as Alternative C would provide the highest degree of restrictions to protect other resources (Appendix R).

Special Designations: In Alternative C, all sage-grouse general habitat and Greater Sage-Grouse PPAs would be managed as one Travel Management Area (Refer to Map 2-5). Cross-country travel for administrative purposes within the Greater Sage-Grouse PPAs may be more limited when a project-level Travel Management Plan is developed because of the ACEC designation.

Impacts under Alternative D (Preferred Alternative)

Travel would be by designated roads and trails in the three named TMAs and by existing roads and trails in the TMA which constitutes the general planning area. The roads and trails system would not be designated as part of this RMP. Travel management planning would be initiated within two to five years of the signing of the SD RMP/EIS Record of Decision.

Designating priority areas for travel management planning, identifies areas in need of resolving conflicts between motorized and non-motorized users and/or conflicts with travel management recreational users creating natural resource management concerns. Under Alternatives B, C and D, the following TMAs would be used for travel management planning after the Record of Decision for the RMP: Center of the Nation in western Butte County and southern portions of Harding County (Map 2-1); the Fort Meade ACEC in Meade County (Figure 2-1); and the Exemption Area in Lawrence County Figure 2-3).

Fluid Minerals – Leasable: Under Alternative D, the amount of oil and gas development would be the second highest authorized on BLM lands. With development, new roads would be constructed to access new oil and gas well sites and could affect vehicle use patterns. Increased road construction would create more OHV access to public lands, but users may avoid these areas when operations were occurring, displacing them to other areas. These effects would occur mostly within the moderate potential areas for oil and gas development in Butte and Harding counties and continue throughout the life of the RMP.

Lands and Realty

Land Tenure: Approximately 80,000 acres of small isolated tracts of public land have been identified for disposal either through land exchange or by sale throughout the planning area. Exchanging public lands for other lands most likely would have a beneficial effect on OHV use by blocking up existing public lands which would make available a larger area for OHV use and/or possibly gaining legal access to resource valued isolated public lands. The sale of public lands would result in the loss of OHV use associated with those specific public lands sold.

Access: The goal of obtaining legal access or additional legal access to large blocks of BLM-administered lands through private land easements was mentioned in the previous SD RMP. Gaining legal access to resource valued public lands would make available more public land for OHV use for the recreating public, especially during the fall hunting season and to a lesser degree during the spring and summer for publics who enjoy pleasure driving, and viewing wildlife.

Rights-of-Way, Leases and Permits: Approximately 133 acres of short-term disturbance and 77 acres of long-term disturbance are expected under alternative D throughout the life of the plan. ROWs, leases and permits would be granted for surface-disturbing actions such as utility lines, communications sites, oil and natural gas development, and wind farms. These surface-disturbing actions associated with ROWs, leases and permits would create new roads and thereby may increase OHV access to public lands. These effects would occur throughout the planning area and make available more public land for OHV use during the spring, summer, and fall for most dispersed recreational opportunities such as hunting, pleasure driving, and viewing wildlife.

OHV Use and Travel Management Areas: This alternative would have little effect on the volume of OHV use either in the short or long term. Because of the designation's nature, some degree of unauthorized road proliferation would continue primarily in areas limited to existing roads and trails.

Specific OHV use concerns include:

- Motorized vehicle travel off an existing road or trail to retrieve game would not be allowed.
- Motorized vehicle travel off an existing road or trail for up to 300 feet would be allowed to establish a campsite.
- Snowmobile use would not be restricted in the general planning area, but restrictions could be made if use is causing resource damage. The Fort Meade ACEC is closed to snowmobile use except for resource management, by authorized users, and by law enforcement and emergency services in times of emergency. In the Exemption Area snowmobile use is limited to the Michelson Trail and other locations maintained by the SDGFP as part of their snowmobile trails system.

Fort Meade ACEC: While the ACEC is proposed to remain closed to motorized travel off its designated roads and ROWs, management actions are proposed to establish and maintain a system of hiking, biking, and horseback trails with partnership groups assisting in planning and maintenance. Most trails already exist and are receiving casual use or are routes used in special events. About 22 miles of trail would be involved but the final distance could be somewhat less. Establishment of formal marked trails would increase the visitor use of the ACEC. Fort Meade is easily accessible from I-90 and its trail system would have a longer season of use for the public than those in the Black Hills National Forest.

The Fort Meade Backcountry Byway is the only connecting route from I-90 to State Highway 34. It is driven by about 33,000 motor vehicles per year and has steady increase as Sturgis develops to its east. The heaviest period of traffic is around the Sturgis Motorcycle Rally in August. The Byway can be closed for up to six months a year due to weather and

unsafe road conditions. It is also closed during special events when motor vehicle presence would cause safety concerns with event participants and spectators. There would be no new roads for motorized vehicles on Fort Meade ACEC, but existing authorized roads may be realigned to reduce the impact to resources or for public safety.

Commercial venues and housing developments have increased urbanization, especially along I-90 and State 34 corridors. There would be an additional travel on the byway during good weather and more public use of the Fort Meade ACEC's recreation facilities and trails throughout the term of this RMP.

Exemption Area: Scoping did not identify the Exemption Area is a primary use area for OHV users, but if its trail network was developed it would offer access from the towns of Lead and Deadwood to OHV trails on the Black Hills National Forest. In this alternative the BLM would work with user partnerships and the towns to develop OHV trails and non-motorized trails for hikers, bicyclists, and horseback riders. A combination of motorized trails and non-motorized trails totaling about fifteen miles would be developed and maintained.

Another aspect unique to the Exemption Area is snowmobile trails. Presently the SDGFP maintains a snowmobile trail system with its core route based on the Michelson Trail which crosses some BLM-administered lands. In this alternative the BLM would partner with user groups, local entities, and the state to increase snowmobile use on public lands.

Center of the Nation: Travel management planning would move travel from existing roads and trails to designated roads and trails. Roads that are redundant would be closed and roads impacting resources would be rerouted. Temporary roads built for a project would be decommissioned after the completion of the project if they serve no use for access or resource management. This TMA receives the greatest amount of use during the fall hunting seasons and also has the largest acreage in walk-in area. The BLM would work cooperatively with the SDGFP on designated access routes to prevent conflicts between the walk-in areas and OHV travel adjoining BLM-administered lands.

Planning Area: The policy use of existing roads and trails would remain in effect unless their present locations are causing damage to cultural or natural resources. The area near the confluence of the Belle Fourche and Cheyenne rivers has the poorest access to large tracts of BLM. A goal for travel management in this area, known as Two Rivers, is to increase motorized and non-motorized access through easements and the use of new and existing trails.

Renewable Energy: Alternative D would result in lower levels of renewable energy development compared to Alternative A and higher levels than Alternatives B or C. The level of development expected under Alternative D would result in an increase in road density within and near developed areas but at lesser levels that under Alternative A. Renewable energy development and associated roads under Alternative D would be higher than Alternative B or C.

Cumulative Impacts

Cumulative Impacts Common to All Alternatives

Past and present management actions that affect and have affected OHV use include restrictions to protect resources, mineral exploration and development, Lands and Realty surface-disturbing ROWs, cultural and paleontological resource protection, and protection for Native American Traditional Practices. These management actions would cumulatively affect OHV use and users within the planning area.

Future management actions in the planning area and on federal, state, private, and other lands relating to the protection of potential threatened, endangered, and/or sensitive plant and animal species, and protection for cultural resources, paleontological resources, and Native American Traditional Practices have a high potential for affecting motorized recreation uses. The degree of the cumulative impacts are difficult to quantify as the impact varies by the resource concerns in the area and a host of other factors such as the status of the current road network, the types of users that would be affected, and the landownership pattern in a specific area. Actions that restrict access and/or numbers of OHV users result in users looking elsewhere for recreation opportunities. This leads to increased use of the other areas and may result in increased degradation of resources and user conflicts. Protection of resources dictates increased management, which inevitably requires stricter controls on access and user numbers. Connectivity of roads that cross BLM-administered lands to road on lands managed or owned or by other agencies and private parties is a key concern.

Lack of road connectivity has the potential to create adverse cumulative impact to both recreationists and those utilizing resources in the planning area.

Cumulative Impacts under Alternative A (Current Management)

Alternative A would result in few cumulative impacts as this alternative provides the least restrictions. TMAs would not be created. The lack of the coordinated implementation planning associated with TMAs would result in adverse cumulative impacts in the Exemption Area, the Fort Meade ACEC, and the Center of the Nation as routes would not be systematically evaluated for connectivity and efficiency.

Cumulative Impacts under Alternative B

Alternative B would result in a low level of cumulative impacts. The scattered pattern of land ownership in the planning area results in a roads crossing multiple land ownerships. In some cases a proposed road may not be constructed because of restrictions to protect other resources. In other cases a road may be closed as it is unnecessary (duplicate route) or closure is needed to protect other resources. Restrictions related to protection of other resources could result in less flexibility to improve the connectivity of existing or proposed roads. Adverse cumulative impacts would be higher than Alternative A but lower than Alternatives C and D. Impacts to adjacent landowners would include some loss of route connectivity depending on the location of individual routes. Improved coordination through establishment of TMAs and specific project level planning for the TMAs would result in beneficial cumulative impacts compared to Alternative A which does not utilize TMAs. TMAs are shown in Figure 2-1 (Fort Meade ACEC), Figure 2-3 (Exemption Area), and Map 2-1 (Center of the Nation).

Cumulative Impacts under Alternative C

Because restrictions are the greatest in Alternative C, the cumulative impact to Transportation and OHV use would be the highest. The types of adverse impacts associated with resource restrictions are the same as described in Alternative B but the degree of impact would be moderate. Alternative C would result in less flexibility to maintain connectivity across multiple land ownerships. Restrictions to protect other resources would result in a moderate loss of travel opportunities depending on the location of the specific route and the resource concerns present in the area. Improved coordination through establishment of TMAs and specific project level planning for the TMAS would result in the best means to balance travel needs with protection of resources compared to Alternative A which does not utilize TMAs.

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D offers the best balance between resource protection and OHV use. Cumulative impacts to travel would include a minor loss of travel opportunities in areas with high levels of resource concerns but a more coordinated and efficient road system in the TMAs. The types of impacts are the same as described in Alternative B but the degree of impact would be slightly higher as Alternative D would provide more restrictions than Alternative B. Improved coordination through establishment of TMAs and specific project level planning for the TMAs would result in the best means to balance travel needs with protection of resources compared to Alternative A which does not utilize TMAs.

Lands and Realty

This section describes potential impacts to lands and realty from management actions by other resource programs. Lands and Realty addresses management of ROWs, leases and permits; administration of withdrawals; and land tenure adjustments.

Lands and Realty is a resource use program and responds to requests for use and access authorizations, permits, leases or withdrawals, as well as land tenure adjustments from outside entities or other programs. This analysis addresses how implementation of management actions for other resource programs may modify the location, size, or design of a given proposal, such as for a ROW or a land exchange. Such impacts would primarily occur from implementation of management actions designed to protect natural resources and limit impacts on those resources from surface-disturbing

activities and may even preclude approval of a proposal. Therefore, the type and degree of limitations or restrictions placed on a given proposal depends on the location of sensitive or high-value resources and the potential for environmental impacts on those resources.

Land Use Authorizations

Assumptions

Demand for land use authorizations will continue. It is assumed that demand for these authorizations would fluctuate directly with the degree of economic growth and development occurring within and adjacent to the planning area.

It is assumed there would be 6-10 ROW applications processed per year for land use authorizations within the planning area. The acres disturbed would be highly variable but would average one to two acres per ROW authorized. There would be an occasional 2920 permit (Leases/Permits/ Easements) per year with minimal surface disturbance per permit.

Demand to construct utility ROWs would increase, especially for electrical transmission lines, pipelines, and communication towers within the planning area. Management of sensitive resources, including air, cultural and paleontological resources, riparian areas, soils, special designation areas, threatened and endangered species, vegetative resources, wetlands, water, wildlife habitat, and geologic resources would affect land use authorizations and could result in construction delays or the need to relocate proposed ROWs. The need to relocate could result in increased acres of surface disturbance; it is assumed this increase would not exceed 10 percent.

Proposals for ROWs and other land use authorizations would be evaluated on a site-specific basis.

Proposals for facilities and actions projected to degrade resources would have to be mitigated, sited in acceptable alternative locations, or in more extreme cases, denied altogether. Applicants for such proposals would encounter time delays and greater costs in terms of project development.

Unauthorized uses would continue to occur and would be resolved on a case-by-case basis. These would include activities such as occupancy, property abandonment, and ROWs for utility and transportation uses, communication sites, oil and gas pipelines, roads, and water-related facilities installed on public lands without proper approval.

Effects 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 potential effects of the alternatives on the Lands and Realty program and renewable energy, information was gathered from administrative files for lands and realty actions in the planning area and from various actions proposed by other resource programs. The analysis is also based on the professional expertise of BLM specialists at the SDFO and the Montana State Office and the realty specialist's knowledge of the area.

ROW avoidance areas are areas to be avoided, but may be available for location of ROWs with special stipulations.

ROW exclusion areas are areas that are not available for location of ROWs under any conditions. Effects were quantified where possible, and in the absence of quantitative data, best professional judgment was used.

All Revised Statute 2477 roads would continue to be recognized as valid authorizations pending their final resolution.

All land use authorizations require follow up. This may be in the form of monitoring one to two years after authorization to ensure a ROW was constructed and surface disturbance was reclaimed according to stipulations attached to the ROW grant.

Land use authorizations would be monitored according to ROW rules and regulations that require periodic compliance checks to determine that no resource impacts are being caused by the ROW or that the ROW itself is not being impacted. As more ROWs are authorized, the monitoring workload would increase.

Management of leasable, salable, and locatable minerals under all alternatives may result in requests for ROWs for utilities and access.

Any renewable energy development proposed for BLM-administered land would result in requests for site, utility and access ROWs.

The need to manage national trails to protect values for which they were designated could impact applicants for ROWs as well as BLM actions to obtain legal and physical access across non-federal lands to BLM-administered lands. Proposed facilities such as power lines may need to be mitigated (e.g., burial of the line) or rerouted to protect trail values.

Impacts Common to All Alternatives

Vegetative Communities: The management of vegetation would have several environmental consequences. The need to protect riparian and wetland vegetation would impact land use authorizations, land tenure adjustments, and acquisition of legal and physical access to BLM-administered land. Facilities proposed for construction under various land use authorizations or access easements in areas where these types of vegetation are present may need to be mitigated, constructed in alternate locations, or in extreme cases, dropped from consideration. The need to protect certain vegetation types could also result in the restructuring or elimination of a land tenure adjustment proposal such as an exchange or sale. Certified weed free seed would be required for reseeding of authorized land use projects.

Wildlife, Special Status Species and Aquatics: The need to protect wildlife, aquatics and fisheries, and special status species could impact land use authorizations, land tenure adjustments, and the acquisition of legal and physical access to BLM-administered land. Facilities proposed for construction under various land use authorizations or access easements in areas that could adversely affect wildlife or fisheries may need to be mitigated, relocated, or in some cases, dropped from consideration. Specifically, overhead power lines would be required follow recommendations in Suggested Practices for Raptor Protection on Power Lines (Olendorff, et al. 1981) and Suggested Practices for Avian Protection on Power Lines: State of the Art in 2006 (APLIC 2006).

Land tenure adjustments such as exchanges or sales proposed in areas where wildlife or fisheries could be adversely affected may need to be restructured or eliminated from consideration. These types of actions could increase processing costs and time for both the federal and non-federal parties.

Cultural Resources: The management of cultural resources could affect several aspects of the Lands and Realty program including land use authorizations, land tenure adjustments, and the acquisition of legal and physical access to BLM-administered land. These lands and realty actions are considered federal undertakings and must avoid inadvertent damage to federal and non-federal cultural resources through compliance with Section 106 of the 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, and/or mitigation of adverse impacts through data recovery. This could result in rerouting a proposed ROW or road easement, or restructuring or abandoning a proposed land exchange or sale, in whole or in part. These measures can increase processing costs and processing time for both federal and non-federal parties.

Paleontological Resources: Impacts from management of paleontological resources would be very similar to those of cultural resources. Lands and realty projects occurring in known fossiliferous areas would require that adequate time and resources be allocated for conducting an inventory of these resources. Discovery of scientifically important paleontological resources could result in rerouting or redesign of proposed ROW and easement facilities; it could also lead to the restructuring or abandoning of land exchanges or sales, in whole or in part. Such actions can increase processing costs and time for both the federal and non-federal parties.

Fire Management and Ecology: Fire management under all alternatives to manipulate/enhance vegetative composition would generally help protect facilities authorized under the Lands and Realty program by reducing fuel loads through prescribed fire and full suppression. However, there is always a slight possibility of losing control of prescribed fire and damaging above-ground ROW facilities.

Solid Minerals: Management of leasable, salable, and locatable minerals under all alternatives may result in requests for ROWs for utilities and access.

Lands and Realty: Reviewing existing withdrawals and revoking or modifying those that are no longer serving their intended purpose would ensure that BLM-administered land is not unnecessarily encumbered and is open to the widest possible array of public land uses consistent with other portions of the RMP. Such a review would also ensure that withdrawals and classifications still serving their intended purpose would remain in place. Management proposed for new withdrawals under all alternatives would also ensure that such actions encumbered the minimum area necessary to achieve the intended purpose.

Related to health and safety, land use authorizations for uses involving the disposal or storage of materials which could contaminate the land would not be issued. Lands proposed for acquisition or disposal would need to be inventoried for the presence of hazardous materials. The presence of contaminants may lead to actions such as the modification or abandonment of a land exchange proposal, or remediation in the form of cleanup and removal of contaminants.

All land use authorizations require follow-up. This may be in the form of monitoring a year or two after authorization to ensure a ROW was constructed and the surface disturbance reclaimed according to the stipulations attached to the ROW grant. Or it may be monitoring according to ROW rules and regulations which require periodic compliance checks to determine that no resource impacts are being caused by the ROW, or that the ROW itself is not being impacted somehow. As more ROWs are authorized, the monitoring workload increases.

ROW avoidance would result in reduction of opportunities for the public to receive ROWs and other land use authorizations on these lands for proposed projects.

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 impacted and the number of acres required and disturbed by new ROWs. Management actions would be subject to prior existing rights and to Waivers, Exceptions and Modifications, and would be available for use on any surface-disturbing activity, including ROWs and other land use authorizations. This would result in some flexibility in the location of proposed projects. Terminated underground ROWs would remain buried unless they threaten human life or resources.

No lands would be classified as suitable for Desert Land Entry or Indian allotments. Recreation and Public Purposes (R&PP) and other classifications would be allowed as needed as long as they are compatible with RMP objectives.

Refer to Maps 2-15 through 2-18 to view ROW restrictions by alternative.

Transportation and Facilities: Transportation and facilities management could require that easements be acquired for any BLM roads or other types of facilities to be located on non-federal lands. ROW reservations may be needed for BLM roads or other types of facilities such as recreation to be located on BLM-administered land.

Renewable Energy: Any renewable energy development proposed for BLM-administered land could result in requests for site, utility and access ROWs.

Special Designations: The need to manage national trails to protect the values for which they were designated could impact applicants for ROWs as well as BLM actions to obtain legal and physical access across non-federal lands to BLM-administered lands. Proposed facilities such as power lines may need to be mitigated (e.g., burial of the line) or rerouted to protect these trail values. Land tenure adjustments such as sales or exchanges may need to be restructured or eliminated from consideration to avoid disposing of BLM-administered lands containing important trail segments. Management of any BLM-administered lands that may be designated as ACECs could impose stipulations on the use of these areas for land use authorizations and would preclude realty-related disposals of these lands.

Impacts under Alternative A (Current Management)

Under Alternative A, ROWs and other surface-disturbing land use authorizations would be excluded on 5,522 acres in the planning area. The effect of this restriction would result in the public being prohibited from receiving ROWs and

other land use authorizations for proposed projects in those exclusion areas (5,522 acres). This restriction would affect 2 percent of the BLM-administered surface. This restriction on 5,522 acres would result in reduced opportunities and an increase in cost and time for processing ROWs and other land use authorizations on these lands.

The lack of timing restrictions or exclusions on ROWs and other surface-disturbing land use authorizations on BLM-administered lands would result in the public receiving less restrictive ROWs and other land use authorizations on the subject lands. The lack of timing requirements would result in less cost and time for proposed projects. The effect of excluding ROWs and other surface-disturbing land use authorizations on the Fort Meade ACEC (except for designated corridors, 1,066 acres) would result in the public being prohibited from receiving ROWs and other land use authorizations on these lands.

The effects of requiring special features on the Fort Meade ACEC such as buried low-voltage power lines (if feasible) for ROWs or other land use authorizations would result in an increase in the time needed and cost for ROW application. In some cases it would result in avoidance or project denial.

The effect of allowing prescribed fire treatments on 500 acres of federal BLM-administered surface would result in ROWs and other land use authorization facilities, such as power lines and communication sites, being protected by reducing fuel loads and suppressing fires. This management action would affect less than 1 percent of BLM-administered surface.

On the Fort Meade ACEC, new R&PP leases, firearm and archery ranges, and new roads would be prohibited. Use of firearms for hunting and target shooting would be prohibited on portions of the ACEC (Figure 2-2). Addressing trespass issues in this alternative would require removal of all trespass structures. Prohibiting these authorizations for ROWs or other land use authorizations would result in an increase in the time and cost needed to process requests, and would prohibit these actions on 5,522 acres or 2 percent of the BLM-administered surface.

Impacts under Alternative B

Under Alternative B, 189,153 acres (70 percent) of BLM-administered public lands in the planning area would be designated as ROW avoidance areas, which would restrict ROWs and other realty-related land use authorizations that result in surface-disturbing activities. This restriction would result in a limitation on ROWs and other land use authorizations on these lands.

Approximately 84,137 acres (31 percent) would be available for ROW development with stipulations which would accommodate desired placement of facilities, accommodate access and efficiency in placement of facilities and minimize additional costs.

Avoidance areas on ROWs and other surface-disturbing or disruptive land use authorizations on BLM-administered lands would result in limitations on constructing ROWs and other land use authorization projects at certain times, increase the cost and time for proposed projects, and reduce opportunities for obtaining ROWs and other land use authorizations. In some cases it would result in project denial. The inventory required to follow various management actions would result in increased cost and time of processing proposed ROWs and other land use authorization applications.

Avoidance areas for above-ground power lines would result in limitations for project proposals in the following areas. The requirement to bury power lines would result in an increased amount of surface disturbance as compared with overhead power lines. Above-ground power line avoidance areas include Protection Priority Areas (PPAs) and nesting/brooding areas with a 3 mile buffer from sage-grouse leks in the General Habitat Areas (GHAs). A total of 14,741 acres (5.4 percent) of BLM-administered public lands are within three miles of sage-grouse lek buffer areas in the GHA and within BLM-administered public lands in the Greater Sage-Grouse PPAs. Surface use would be prohibited in big game and sage-grouse winter concentration areas (121,406 acres). Additionally, excluding paleontological localities or cultural site boundaries would result in prohibition of ROW and other land use authorizations near the localities/sites. This would potentially result in an increase in the cost and time for proposed projects and reduce the opportunity for the public to obtain ROWs in these areas. Under Alternative B, land use and ROW requirements would be more restrictive than Alternative A and less restrictive than under Alternative C.

Requiring special features such as fish passages, buried power lines (unless technologically unfeasible) and other special design and/or timing features for ROWs or other land use authorizations would result in an increase in the time and cost for ROW applications. In some cases project proposals would result in avoiding an area or denying an application. Noise restrictions related project proposals could result in some project denials.

The effect of burying power lines, unless technologically unfeasible, would result in prohibition of overhead power line ROWs on some power line projects within the planning area. Burying power lines would increase costs and timing of such projects and possibly cause conflicts if power lines on adjoining lands were overhead lines. The requirement to bury power lines would result in an increase in the amount of surface disturbance compared with overhead power lines.

Allowing prescribed fire treatments on 500 acres of BLM-administered public land each year would result in ROWs and other land use authorization facilities being protected by reducing fuel loads and suppressing fires. This management action would affect less than 1 percent of BLM-administered surface per year.

Under this alternative, new R&PP leases could be allowed within the Fort Meade ACEC, and trespass issues would be resolved through termination, removal or authorization; power lines 35KV or less (and other utility lines) would be buried in corridors; and military exercises would be authorized if compatible with current management plans. Restrictions in the Fort Meade ACEC would result in an increase in the time and cost associated with processing land use authorizations. These restrictions would prohibit land use authorizations on 5,522 acres (2 percent) of BLM-administered public lands. These would be more restrictive than Alternative A and less than Alternative C.

Impacts under Alternative C

Under Alternative C, excluding ROWs and other surface-disturbing land use authorizations on 199,420 acres (73 percent of BLM-administered lands) within the planning area would result in an overall increase in the cost and time involved in proposed projects. There would be reduced opportunities and availability of ROWs and other land use authorizations in those areas excluded from ROWs on BLM-administered public lands. Total acres of BLM-administered surface excluded from ROWs and other land use authorizations are greater than in either Alternative A or B.

Excluding ROWs and other surface-disturbing activities on BLM-administered lands would result in prohibition of ROWs and other land use authorizations for proposed projects unless the action would be beneficial to or maintain habitat functionality. In this alternative, excluding above-ground power lines (and requiring power lines to be buried) in certain areas would result in an increase in the cost and time of such projects and possibly cause conflicts if the power line on adjoining lands were overhead lines. The requirement to bury power lines would result in an increase in the amount of surface disturbance compared with overhead power lines. This restriction (prohibiting above-ground power lines) includes nesting/brood rearing areas within four miles of sage-grouse lek buffers in the GHA. Greater Sage-Grouse PPAs include timing restrictions within big game and sage-grouse winter concentration areas. Additionally, excluding paleontological localities or cultural site boundaries would result in prohibition of ROW and other land use authorizations near the localities/sites. It would also likely result in an increase in the cost and time for proposed projects and reduce opportunities for the public to receive ROWs. Acres and percentages of BLM-administered surface excluded would be greater than in both Alternatives A and B.

Alternative C would exclude all sensitive and high value resources from all types of ROWs (refer to Table 2-1 and Appendix R) resulting in the highest level of ROW restriction.

Requiring special design features for ROWs and other land use authorizations, such as fish passages, buried power lines or relocation of lines would result in an increase in the time needed to process the application and the cost for applicants who apply for ROWs.

If power lines could not be sited or designed to maintain habitat functionality, an increase in the cost and time for proposed projects and reduced opportunities for obtaining ROWs would result. In cases where it is not technologically feasible to bury lines, proposed ROWs would be denied. Buried power lines and other special design features would possibly cause conflicts if the rest of the power line on adjoining lands were overhead lines. The requirement to bury power lines would result in an increase in the amount of surface disturbance involved in a proposed project as compared with overhead power lines.

If avoidance of ROWs and other surface-disturbing land use authorizations or disruptive activities is not possible within ROW avoidance areas, surface-disturbing or disruptive activities would be addressed at the project level to determine if special design features to improve or maintain PFC or to minimize impacts to resource considerations in the ROW avoidance areas could be addressed.

In this alternative, allowing prescribed fire treatments on 500 acres of BLM-administered public land each year would result in ROWs and other land use authorization facilities being protected by reducing fuel loads and suppressing fires. This management action would affect less than 1 percent of BLM-administered surface per year.

Within the Fort Meade ACEC, new R&PP leases would be allowed; trespass issues would be resolved through termination, removal or authorization. Power lines 35KV or less and other utility lines would be buried in corridors; and military exercises could be authorized if compatible with current management plans. Restriction to these land use authorizations within the ACEC could result in an increase in time and cost for applicants who apply. No target/shooting ranges would be authorized except the existing muzzleloader range. New roads would be prohibited. These land use authorizations being prohibited would result in an increase in the time needed and cost for applicants who apply. These restrictions would prohibit actions on 5,522 acres or 2 percent of the BLM-administered surface. The Fort Meade ACEC alternatives are the same as in Alternative B.

Impacts under Alternative D (Preferred Alternative)

Under Alternative D, non-renewable energy ROWs would not be allowed on 5,836 acres (2.1 percent of the planning area), which would be designated as exclusion areas. This would prohibit and restrict ROW development in these areas. Approximately 191,704 acres (71 percent) of BLM-administered public lands in the planning area would be designated as ROW avoidance areas, which would restrict ROWs and other realty-related land use authorizations that result in surface-disturbing activities. This restriction would result in a limitation on ROWs and other land use authorizations on these lands. Approximately 75,750 acres (28 percent) would be available for ROW development which would accommodate desired placement of facilities, accommodate access and efficiency in placement of facilities, and minimize additional costs.

Avoidance areas on ROWs and other surface-disturbing or disruptive land use authorizations on BLM-administered lands would result in the public being limited in constructing ROWs and other land use authorization projects at certain times. Timing restrictions could result in an increase in the cost and time for proposed projects. Avoidance areas for above-ground power lines would result in the public being limited from receiving overhead power line ROWs in the subject areas. The requirement to bury power lines would result in an increase in the amount of surface disturbance involved in a proposed project as compared with overhead power lines. Above-ground power line avoidance areas include PPAs and within four miles of sage-grouse leks in the GHA. A total of 32,865 acres or 12 percent of BLM-administered surface are within four miles of sage-grouse lek buffers on BLM-administered surface in Greater Sage-Grouse GHA. Surface use would be prohibited in big game and sage-grouse winter concentration areas. The acres and percent of BLM-administered surface within big game and sage-grouse winter concentration areas are unknown, and applications on subject lands would be considered on a case-by-case basis.

Additionally, excluding paleontological localities or cultural site boundaries would result in the public being prohibited from receiving ROW and other land use authorizations near the localities/sites. This would potentially result in an increase in the cost and time for proposed projects and reduce the opportunity for the public to receive ROWs. Requirements listed above would be more restrictive than Alternative A but less restrictive than Alternative C.

Requiring special features such as fish passages, buried power lines (unless technologically unfeasible) and other special design and/or timing features for ROWs or other land use authorizations would result in an increase in the time and cost for applicants who apply for ROWs. In some cases a proposed project would result in an area avoided or being denied. Noise restrictions could result in some projects being denied.

Burying power lines unless technologically unfeasible would result in the public being prohibited from receiving overhead power line ROWs on some power line projects within the planning area. Buried power lines would result in an increase in the cost and time of such projects for the applicant and would possibly cause conflicts if the rest of the power

line on adjoining lands were to be overhead lines. The requirement to bury power lines would result in an increase in the amount of surface disturbance involved in proposed project as compared with overhead power lines.

On the Fort Meade ACEC, new R&PP leases would be allowed, trespass issues would be resolved through termination, removal or authorization, power lines 35KV or less and other utility lines would be buried in corridors, and military exercises authorized if compatible with current management plans. Restriction to these land use authorizations could result in an increase in the time and cost for applicants who apply. No target/shooting ranges would be authorized except the existing muzzleloader range. New roads would be prohibited. These land use authorizations being prohibited would result in an increase in the time and cost for applicants who apply. The restrictions would prohibit these actions on 5,522 acres or 2 percent of the BLM-administered surface. The Fort Meade ACEC alternatives are the same as in Alternatives B and C.

Withdrawals

Assumptions

Withdrawals would continue to be used to protect critical resources or significant government investments.

Proposals for withdrawals would be evaluated on site-specific analysis basis.

Proposals for withdrawals and actions that are projected to degrade these resources would have to be mitigated, sited in acceptable alternative locations, or in more extreme cases, denied altogether. Applicants for such proposals would encounter time delays and greater costs in terms of project development.

Impacts Common to All Alternatives

Reviewing existing withdrawals and revoking or modifying those that are no longer serving their intended purpose would ensure that BLM-administered lands are not unnecessarily encumbered and are open to the widest possible array of public land uses consistent with other portions of the RMP. Such a review would also ensure that withdrawals and classifications still serving their intended purpose would remain in place.

Management proposed for new withdrawals under all alternatives would also ensure that such actions encumbered the minimum area necessary to achieve the intended purpose.

Impacts under Alternative A (Current Management)

Allowing the transfer of any requested acreage of land to the Black Hills National Cemetery to expand the existing cemetery facility would reduce the size of the Fort Meade ACEC by that amount of acreage. The effect of continuing the withdrawal of the Fort Meade and Fossil Cycad ACECs from mineral entry would be that 6,894 acres would continue to be unavailable for mineral development. Land available for potential withdrawal is more than Alternative C but less than Alternative B.

Impacts under Alternative B

Allowing the transfer of the up to 170 acres of land to the Black Hills National Cemetery to expand the existing cemetery facility would reduce the size of the Fort Meade ACEC by up to 170 acres and would only allow the minimum acreage needed for expansion. Transferring up to 50 acres to the National Guard would reduce the size of the Fort Meade ACEC by up to 50 acres and would only allow the minimum acreage needed for transfer. The effects of continuing the withdrawal of the Fort Meade and Fossil Cycad ACECs from mineral entry would be that 6,894 acres would continue to be unavailable for mineral development.

In Alternative B, no federal mineral estate except for the acres within the ACECs would be recommended for withdrawal, resulting in 6,894 acres within the planning area that would be open and available for mineral development. The amount of land potentially withdrawn in Alternative B is more than Alternative A or C.

Impacts under Alternative C

Under Alternative C, a total of 309,576 acres of federal mineral estate would be recommended for withdrawal from mineral entry, which includes the Fort Meade ACEC (6,574 acres), Fossil Cycad ACEC (320 acres), Bear Butte State Park (410 acres), Black Hills Army Depot (12,709 acres) and Greater Sage-Grouse PPAs (289,563 acres). Withdrawal of 309,576 acres would eliminate potential for development of federal minerals and surface-disturbing activities.

Impacts under Alternative D (Preferred Alternative)

Alternative D is a combination of Alternatives B and C. Under Alternative D, 7,304 acres would be recommended for withdrawal from mineral entry, including the Fort Meade ACEC (6,574 acres), Fossil Cycad ACEC (320 acres), and Bear Butte State Park (410 acres). While these restrictions would protect resource values at these sites, the opportunity to explore for and development minerals would be eliminated. Allowing the transfer of up to 170 acres of land to the Black Hills National Cemetery to expand the existing cemetery facility would reduce the size of the Fort Meade ACEC by up to 170 acres and would only allow the minimum acreage needed for expansion. Transferring up to 50 acres to the National Guard would reduce the size of the Fort Meade ACEC by up to 50 acres and would only allow the minimum acreage needed to be transferred. The effects of continuing the withdrawal of the Fort Meade and Fossil Cycad ACECs from mineral entry would be that 6,894 acres would continue to be unavailable for mineral development.

The effects of withdrawing 410 acres of mineral estate within Bear Butte State Park would be that 410 acres would not be available for mineral development. Withdrawing 410 acres within Bear Butte State Park would eliminate potential for development of federal minerals and surface-disturbing activities. This would help protect the Native American interests.

Land Tenure Adjustment

Assumptions

There would be continued disposal of federal BLM-administered public lands and acquisition of non-federal lands or interests through sales, exchanges, transfers, direct purchases, donations, and withdrawals on a case-by-case basis. The acquisition emphasis would be alternative-dependent and vary according to objectives—resource values, economic values and access, or developable resources. Management of cultural and paleontological resources, biological resources, and special designation areas would limit or prevent disposal and acquisition actions or provide justification for the action to take place. Demand would continue, from both within and outside the BLM, for land tenure adjustments to improve the manageability of federal and non-federal lands. Land exchanges would continue to be the preferred method of land tenure adjustment. Due to the relative differences in appraised values between federal and non-federal lands, it is expected that in equalizing the values in a land exchange there would be a net loss of the BLM-administered acres and an increase of private (or state) land acres. This is viewed as a positive effect of a land exchange on local taxes.

Land identified for disposal would usually go into state or private ownership and would be used for its highest and best use (residential, commercial, industrial, agricultural, or for public purposes).

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. Road and trail easement acquisition from willing sellers would be the primary method of acquisition; however, all opportunities to obtain public access to the public lands will be addressed.

Effects analyses and conclusions are based on interdisciplinary team knowledge of resources, reviews of existing literature, and information found in BLM records and provided by other agencies and institutions. It is expected that proposals for land tenure adjustments to improve manageability of federal and non-federal lands will continue to be brought forth on an occasional basis. Due to differences in appraised values, it is expected there would be a net loss in acres of BLM public lands in most exchange transactions.

In terms of health and safety, withdrawals for uses which would involve the disposal or storage of materials which could contaminate the land would not be issued. Lands proposed for acquisition or disposal would need to be inventoried for the presence of hazardous materials. The presence of contaminants may lead to actions such as the modification or abandonment of a land exchange proposal, or remediation in the form of cleanup and removal of the contaminants.

The management of soil, air, water, vegetation, wildlife, cultural, paleontological, and wetland/riparian resources could affect land use authorizations such as ROWs, leases, or permits. BLM actions to obtain legal and physical access to BLM-administered land or to exchange BLM-administered land could also be impacted by the management of soil, air, water, vegetation, wildlife, cultural, paleontological, and wetland/riparian resources.

Land tenure adjustments such as exchanges or sales proposed in areas where wildlife or fisheries could be adversely affected may need to be restructured, relocated or eliminated from consideration. These types of actions could increase processing costs and time for both the federal and non-federal parties.

Land tenure adjustments such as sales or exchanges may need to be restructured or eliminated from consideration in order to avoid disposing of BLM-administered lands containing important trail segments.

Impacts Common to All Alternatives

Management actions to protect air, soils, and water quality would affect BLM actions to obtain legal and physical access to public lands.

Land exchanges would continue to be the preferred method of land tenure adjustment which would maintain the public land base.

Vegetation management, and the need to protect special status species, riparian, and wetland vegetation would impact land tenure adjustments and acquisition of legal and physical access to public lands. The need to protect certain vegetation types would also result in restructuring or elimination of a land tenure adjustment proposal such as an exchange or sale. The BLM would encounter time delays and greater costs in terms of project development as a result of these effects.

Fish and wildlife (including aquatics) management and protection of special status species (and other species of fish and wildlife requiring special protections) would impact land tenure adjustments and the acquisition of legal and physical access to public lands. In some cases land tenure adjustments such as exchanges or sales would be restructured or eliminated from consideration as a result of the need to lessen the effects to wildlife or fisheries. As a result, these types of actions would increase processing costs and time for both the federal and nonfederal parties. Land tenure adjustments would also be used to acquire lands with important wildlife or special status species habitat.

Management of cultural resources would affect land tenure adjustments and the acquisition of legal and physical access to public lands. These Lands and Realty actions are considered federal undertakings and must avoid inadvertent damage to federal and nonfederal cultural resources through compliance with Section 106 of the NHPA. As a result, 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. This would result in actions such as restructuring or abandoning a proposed land tenure adjustment such as a land exchange or sale. Land tenure adjustments would also be used to acquire lands with important cultural resources. The BLM would consult with interested tribes to identify cultural values or religious beliefs that would be affected by BLM-proposed actions. The result of such actions would increase processing costs and processing time for both the federal and nonfederal parties.

Impacts from the management of paleontological resources would be similar to those of cultural resources. Lands and realty projects occurring in known fossil-bearing areas would require that adequate time and resources be allocated to conduct resource inventory. The presence of these resources would also result in the restructuring or abandoning 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.

BLM access easements occasionally require mitigation where livestock grazing occurs (including exclusion or elimination of livestock grazing during the construction and rehabilitation phases of the project). Mitigation would also be required to facilitate livestock movement or provide for public safety (e.g., fencing and cattle guards). Because of these requirements, the BLM could encounter time delays and greater costs in terms of project development.

Travel management and OHV use could require that easements or permits be acquired for any BLM roads or other types of facilities to be located on non-federal lands. As a result of the need for an easement or permit, the BLM could encounter time delays and greater costs in terms of project development.

Recreation management actions (including designation of SRMAs), Back Country Byways and National Trails management could result in land tenure adjustments or easement or permit acquisitions to improve access to public lands for recreation opportunities. As a result of these needed actions, the BLM could encounter time delays and greater costs in terms of project development.

Transportation and facilities management would require that easements or permits be acquired for any BLM roads or other types of facilities to be located on non-federal lands. The BLM could encounter time delays and greater costs in terms of project development as a result of the need for these easements or permits.

Rerouting, closing, or decommissioning existing roads, primitive roads, or trails which are substantially contributing to resource impacts, in some cases would result in loss or restriction of access to tracts of federal BLM-administered land.

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. Land tenure adjustments would be considered based on retention, acquisition, and disposal criteria that can be found in Appendix I. Actions such as exchanges, sales, and purchases would result in the adjustment of the fragmented public land pattern to better manage public lands. All land exchanges would be restricted to lands within South Dakota. Land tenure adjustments would be on a willing participation basis unless required by law, regulation, court order, or Congressional action.

Consolidation of public land holdings would result in a reduction in encroachment problems on public lands from adjacent property owners and land users. Consolidation of public land holdings would also 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 or easement purchase and land donations.

Lands that meet R&PP classification criteria for public purposes could be considered for acquisition by state and local governments and other qualified organizations on a case-by-case basis. This would result in those entities being assisted in meeting the need for reasonably priced land to serve a broad array of public needs. Other types of entry would also be considered on a case-by-case basis.

Inventorying lands for hazardous materials (the presence of which would be subject to modification or abandonment of a land tenure adjustment proposal or remediation in the form of cleanup and removal of contaminants) could result in additional costs and time for the BLM to complete the proposed land adjustment. The BLM would not acquire contaminated land except at the direction of Congress or for good cause with approval of the Secretary.

Lands or interest in lands that would be acquired by purchase, exchange, revocation of another agency's withdrawals, administrative transfer from another agency, cooperative agreement, donation, or discovered through land status updates and corrections would be managed under the same management prescription as adjacent public lands. If lands are isolated, they would be managed the same as comparable, nearby public lands. All land or mineral ownership adjustments would be managed as similar lands are under the approved RMP. Lands acquired within or adjacent to administratively designated special management areas, such as ACECs which have valuable resources, would be managed the same as the special management area. Protections of newly acquired lands would be considered as part of the analysis prior to acquisition. All proposed land tenure adjustment actions would be evaluated under project level planning.

Existing access to BLM-administered lands would be retained in conveyance documents, pursuit of reciprocal rights for public access when granting a BLM ROW would occur when appropriate.

All entitlements were completed to the State of South Dakota, and no other entitlement would be considered.

Demand for adequate public access is expected to exceed access acquisition opportunities over the life of the RMP. Easement acquisition and land exchange is likely to be the primary means of acquiring access when opportunities arise.

Impacts under Alternative A (Current Management)

Considering land tenure adjustments on a case-by-case basis based on retention, acquisition and disposal criteria would allow for the parcels acquired and disposed of, to be beneficial to the public and the resources. In some cases it would mean seeking alternative proposals or eliminating the proposal.

The retention and disposal lands identified in the current Land Use Plan (South Dakota Resource Management Plan) as amended and in the BLM 1989 State Director's Guidance on Access are carried forward into this plan. Disposal of individual tracts within the retention zone would occur when significant public benefits result. Approximately 194,000 acres are identified for retention and approximately 86,528 acres (about 31 percent of BLM-administered surface) are identified for disposal within the planning area.

The possible disposal of 5.83 acres to the City of Sturgis would have little effect on the uses that occur within the Fort Meade ACEC. The potential for the Department of Veterans Affairs to acquire up to 170 acres for additional cemetery space would affect the resources and resource uses on the Fort Meade ACEC. It would eliminate an open space buffer to the Centennial Trail, change the size and lower the number of AUMs available for livestock grazing in the South pasture of the Fort Meade allotment, and would disturb the area and cause disruption to the elk winter range.

Impacts under Alternative B

Considering land tenure adjustments in three categories would retain areas that need protection from leaving public ownership, allowing for the retention, acquisition and disposal of areas meeting criteria that are beneficial to the public and the resources. The three categories would be: retention area with no disposal (6,894 acres), retention with limited disposal potential based on specialist review (186,424 acres), or disposal contingent on specialist review (86,528 acres). The effect of considering jurisdictional transfers to other federal agencies would be more efficient management for the agencies involved.

The inventory required for protective actions for hazardous materials, special status species and other requirements would result in an increase in the cost and time of processing proposed disposal actions. This management action would result in some lands eliminated from consideration for disposal. However, evaluation of individual proposed disposal actions under any of the alternatives would consider special status species and other mandated considerations and would result in their protection.

Management actions requiring fish passage would result in an increase in the time needed and cost for constructing the road or trail within access easements.

Impacts under Alternative C

Impacts would be the same as Alternative B.

Impacts under Alternative D (Preferred Alternative)

.Impacts would be the same as Alternative B.

Cumulative Impacts Common to All Alternatives

As the population continues to shift from urban areas to a more rural setting, more land is subdivided. This would result in an increasing demand for ROWs to address private and governments access needs, enhanced telecommunications capacity, and increased demands for power, both hydroelectric and wind-generated. As more private lands are closed to

recreational use by the public, the public will turn their attention to BLM public lands; consequently, there would be an increased demand and emphasis for recreational access, whether through acquisition of access easements, negotiating conservation easements that provide access, or land exchange proposals that enhance land patterns and access.

Minerals

The overall goal of the BLM minerals program is to make mineral resources available from federal mineral estate while minimizing any potential adverse impacts to the environment, public health and safety, and other resource values and uses. This section discusses potential impacts from proposed management actions for other resources on developing mineral resources.

Potential impacts on 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 subject to NSO, TL, and CSU leasing constraints. A much higher number of constraints have been applied to the leasable minerals portion (primarily oil and gas) of the mineral estate, as opposed to the locatable or salable minerals. These values can be used to project the reduction in the number of oil and gas wells that would be drilled, reduction in federal mineral production and, ultimately, reduction in realized federal royalty.

Because RMP decisions are mostly broad resource allocations, a high degree of specificity often is not possible. Site-specific analysis is usually conducted as RMP decisions are implemented on the ground. For the purpose of this analysis, short-term impacts occur within five years of a given management action. Long-term impacts continue past five years or take more than five years to come to fruition.

Assumptions

Assumptions used in developing this impact assessment include:

- The Fort Meade Recreation Area (6,574 acres) would be closed to all mineral entry.

Leasable Minerals

RFD actions for minerals that are applicable to evaluation of potential impacts are set forth in the Reasonably Foreseeable Development section of this chapter.

Impacts Common to All Alternatives

The RMP process allows the BLM to decide what lands are suitable for fluid mineral leasing and, if suitable, what restrictions should be placed on the lease. Proposed restrictions are categorized as: No Surface Occupancy (NSO) stipulation, Controlled Surface Use stipulation (CSU), and Timing Limitation (TL) stipulation. There are also lands that are leased without specific lease stipulations. Refer to Maps 2-25 through 2-28 to view oil and gas restrictions by alternative.

The NSO stipulation is considered the most restrictive constraint for mineral leasing. An NSO stipulation would not automatically preclude a lease from being developed. The restriction of surface occupancy would require that any wells and associated facilities be located on lands within three miles (at most) with current directional and horizontal drilling technology. However, larger contiguous blocks of NSO would likely be precluded from any future development.

The CSU and TL stipulations are less restrictive than NSO constraints. 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 TL stipulation specifies certain dates throughout the year that oil and gas projects would 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 area. The CSU may place more scrutiny on monitoring oil and gas projects.

The NSO, CSU and sometimes the TL stipulations that are applied because of wildlife concerns would not apply to operation and maintenance of production facilities. Appendices E.1 through E.4 describes the stipulations and the Waivers, Exceptions, and Modifications (WEMs) criteria that could be applied to lease stipulations and provides instances where lease stipulations may be waived, exempted, or modified.

Acreage figures are approximations based on GIS analysis. The acreages represent a single stipulation's areal extent. There may be areas where multiple stipulations overlap. In the instances where there is overlap, the most restrictive stipulation would be employed to ensure proper resource protections. Areal extent affected by a management action may change through the life of the plan based on new knowledge obtained on resources, new refinements in definitions, as well as new applications of technology. These changes will normally be documented via plan maintenance.

Air Quality: The goal for air resources across all alternatives in the planning area is to ensure that BLM authorizations and management activities protect the local quality of life and sustain economic benefits by complying with tribal, local, state, and federal air quality regulations, requirements and implementation plans. This would be accomplished by employing the use of BMPs, Best Available Control Technologies (BACTs), and mitigation measures in conjunction with evaluating air quality impacts at the planning level and implementing appropriate monitoring and mitigation plans. These activities could potentially limit oil and gas exploration and development activities in certain areas.

Water Resources: Maintaining ground and surface water quality would involve using BMPs as mitigation measures to limit the effect of materials used to drill and produce oil and gas wells, as well as adequate disposition of fluids produced. These measures would add to costs.

Soil Resources: Maintaining healthy soil function would involve using BMPs as mitigation measures to limit the effect of materials and practices used to drill and produce oil and gas wells, as well as adequate disposition of fluids produced. SDFO Reclamation, Monitoring, and Mitigation Guidelines would be followed to help maintain functioning. These measures would add to costs.

Vegetative Communities: Vegetation management would require reclamation and weed control mitigation measures for surface-disturbing activities to help re-establish native plant species on disturbed areas and eliminate weeds. All BLM-authorized activities would be evaluated for potential effects on special status plants. Surface-disturbing activities would require mitigation such as use of best management practices, seasonal restrictions, relocation of project to avoid sensitive plants and/or inventory the project area prior to any disturbance.

Noxious Weeds and Other Invasive Species: BMPs would be used in all new projects and pesticide use proposals. Weed-free straw and mulch, as well as certified weed-free seed in reclamation, would be used. All these measures would add to costs.

Wildlife, Including Special Status Species, and Aquatic and Fisheries Resources: Goals and management include ensuring that native wildlife and special status species are provided habitat of sufficient quality and quantity to enhance biological diversity and sustain their long-term and self-sustaining persistence, as well as economic, social and ecological values. Populations of native plants and animals are well distributed across the landscape. Suitable habitat condition would be provided to allow for movement between large blocks of habitat and seasonal and specialized habitats on a local and landscape scale. Reflectors would need to be installed on fences for sage-grouse. Water would need to be managed to reduce the spread of West Nile virus within sage-grouse habitat areas. Aquatic habitat of suitable quality would be maintained. These measures would add to costs.

Cultural Resources and Traditional Cultural Properties: Cultural resource management would potentially affect the timing, location and size of oil and gas disturbances and facilities; however, it would rarely prevent development or completion of oil and gas activities. As is the case with existing management, any future oil and gas facilities would be relocated to avoid disturbance to cultural resources. In all cases of federally permitted surface-disturbing activities, a cultural inventory and subsequent cultural clearance would be required prior to approval. Surface-disturbing activities would be limited within selected Native American traditional and religious sites. NSO would be applied to the Black Hills Ordnance Depot and town site of Igloo.

Paleontology: Avoidance of important paleontological resources could result in relocation of oil and gas facilities or delay facility placement until paleontological resources are collected and removed.

Visual Resources: VRM would affect placement of oil and gas facilities on BLM land and could exert an influence on finding acceptable locations where development might occur, as well as the size and coloration of facilities depending on the visual class and location. While VRM requirements vary by classification, with Class I being the most restrictive and Class IV the least restrictive, VRM requirements do not preclude development.

Fire Management and Ecology: Fire and fuels management assigns top priority to areas with high resource or human values when it comes to fire suppression. Oil and gas development areas and associated infrastructure would be included on this list. Wildfires generally cause minimal indirect effects on the development and production of oil and gas resources, but they can be devastating when they occur. Health and safety impacts for oil and gas personnel can be significant. Fuel treatments designed to reduce fuels and meet other multiple-use resource objectives would benefit oil and gas production by reducing wildfire size and intensity, thereby reducing threat of loss of oil and gas facilities to wildfire where the potential exists.

Livestock Grazing: Livestock grazing mitigation measures applied to the fluid minerals program would increase operational complexity to provide for protection of livestock watering facilities, installation, upkeep and repair of fences/gates and cattle guards affected by oil and gas activities, control of invasive (noxious) weeds, minimization of forage loss, and prevention of mortality or injury to livestock. These measures would add to costs.

Recreation: The Fort Meade Recreation Area would be precluded from oil and gas development. Dispersed recreation would be opened up more by some oil and gas roads, which could result in minor conflicts.

Travel Management and Transportation: Effective transportation and travel management for maintenance of the BLM transportation system would benefit fluid mineral development by providing for public safety and adequate access for mineral development tasks. In most cases, industry would use the existing road network for initial access to potential oil and gas exploration sites and access for geophysical exploration. Once oil and gas exploration moves into the developmental phase, industry would be required to improve and maintain existing BLM roads or develop new roads and routes as appropriate. Conversely, a BLM decision to close a specific road may adversely affect an oil and gas operator if it historically had been used as part of their lease operation.

Lands and Realty: Lands and realty management actions rarely have an effect on oil and gas operations. Corridors established for utility/transportation systems and ROWs for existing linear transmission facilities would be avoided, where possible, for placement of oil and gas development activities and infrastructure. This may relocate, but rarely preclude, any oil and gas facility. ROWs granted for wind energy development may influence oil and gas development in areas where project proposals would occupy the same area. In that case, the conflicts and necessary mitigation would be worked out on a case-by-case basis.

Locatable and Salable Minerals: Fluid mineral resource management conflicts associated with development of other minerals would be minimal. If this situation were to arise, the conflict between fluid mineral development and other mineral development (usually locatable minerals) would generally be addressed on a case-by-case basis.

Renewable Energy: Fluid mineral resource management conflicts associated with development of renewable energy would be minimal. If this situation were to arise, the conflict between the fluid mineral development and renewable development would generally be addressed on a case-by-case basis.

Public Safety: In the unlikely siting of fluid minerals on reclaimed or unreclaimed abandoned mine lands, a careful evaluation of liability and reclamation would be necessary. Careful consideration to avoid worsening the chance of a debris flow occurring in and near lands with a steep gradient would also be necessary. Hazardous materials laws would require careful consideration and possibly great expense to avoid violations.

Special Designations: The continued withdrawal of the Fort Meade and Fossil Cycad ACECs from mineral entry would have a negligible adverse effect on leasable minerals.

Impacts under Alternative A (Current Management)

Withdrawn from Mineral Entry: The current area designated as No Lease is 6,894 acres comprised of the Fort Meade and Fossil Cycad ACECs.

Water Resources: Protection of floodplains through an NSO stipulation would necessitate relocating some well sites and drilling some directional or horizontal wells at greater expense. This stipulation would affect acreages shown in Table 4-45.

Table 4-45
NSO – Floodplains* (Acres)

	*Total (All RFDs**)*	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	13,397	3,429	463	9,504
Federal Minerals	63,426	6,646	2,507	54,273

*Table 2-2 Cross Reference: Water, Management Action 1.
**In all cases in Leasable Minerals, for Tables 4-45 through 4-77, "All RFDs" and RFD Categories: High, Moderate, Low, Very Low, and None, refer to the Oil and Gas RFD.

Soil Resources: Acreages in Table 4-46 would be affected by a 30 percent slope CSU stipulation, which would require an engineering and reclamation plan.

Table 4-46
CSU - 30 Percent Slope* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	8,575	82	125	8,368
Federal Minerals	40,476	590	651	39,136

*Table 2-2 Cross Reference: Soils, Management Action 1.

Wildlife, Including Special Status Species, and Aquatic and Fisheries Resources: Alternative A does not include any Greater Sage-Grouse PPAs. The unconstrained RFD scenario numbers of wells would still be valid. NSO areas would be small, and all acreage would be drilled and adequately accessed from off-site using directional or horizontal drilling. Constraints would change the way the well would be drilled and may change some economic considerations. This would not, however, decrease the amount of drilling within the 20-year life of the RMP.

Acres affected by the NSO stipulation to protect sharp-tailed grouse and greater prairie-chickens are shown in Table 4-47.

Table 4-47
NSO – Sharp-tailed Grouse and Greater Prairie-Chicken Lek – 1/4 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	0	0	0	0
Federal Minerals	163	11	0	152

*Table 2-2 Cross Reference: Wildlife, Management Action 2.

Acres affected by a Timing Limitation stipulation to protect sharp-tailed grouse nesting habitat with a two-mile buffer are shown in Table 4-48.

Table 4-48
Timing Limitation – Sharp-tailed Grouse Nesting - Two Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	1,316	579	101	653
Federal Minerals	15,378	3,839	443	11,094

*Table 2-2 Cross Reference: Wildlife, Management Action 4.

A Timing Limitation stipulation would apply to big game winter range between December 1 and March 31. Acres affected by this stipulation are shown in Table 4-49.

Table 4-49
Timing Limitation – Big Game Winter Range* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD to Not Assessed*
Public Surface	77,750	12,465	3,938	61,347
Federal Minerals	411,150	28,964	17,004	365,133

*Table 2-2 Cross Reference: Wildlife, Management Action 8.

An NSO stipulation would be used to protect bald eagle nesting by not allowing wells to be located within 1/2 mile of a nest. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. This stipulation would affect acreages shown in Table 4-50.

Table 4-50
NSO – Bald Eagle Nests – 1/2 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	0	0	0	0
Federal Minerals	259	0	0	259

*Table 2-2 Cross Reference: Special Status Species, Management Action 1.

An NSO stipulation would be used to protect peregrine falcon nesting by not allowing wells to be located within one mile of a nest. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. Currently, there are no acreages on public surface or public minerals within a one-mile buffer of any peregrine falcon nesting sites. Until some nests are found, there would be no effect on oil and gas development in this alternative. This stipulation is shown in Appendix E.1 as Special Status Species 6.

An NSO stipulation would be used to protect sensitive raptors, including golden eagles, by not allowing wells to be located within a distance of 1/2 mile from a nest. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. This stipulation would affect acreages shown in Table 4-51.

Table 4-51
NSO – Sensitive Raptor Nests – 1/2 Mile Buffer*
(does not include raptors that are listed as threatened or endangered) (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	1,837	145	270	1,423
Federal Minerals	10,635	1,220	881	8,534

*Table 2-2 Cross Reference: Special Status Species, Management Action 6.

An NSO stipulation would apply within 1/4 mile of sage-grouse leks. This would necessitate relocating some well sites and may require some wells to be drilled as directional or horizontal wells, at greater expense. This stipulation would affect acreages shown in Table 4-52.

Table 4-52
NSO – Greater Sage-Grouse Leks – 1/4 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	799	113	0	686
Federal Minerals	2,767	172	45	2,550

*Table 2-2 Cross Reference: Special Status Species, Management Action 9.

Surface use would be prohibited from December 1 to March 31 in crucial winter range for sage-grouse (Table 4-53). This would present a time delay and inconvenience to companies drilling new wells.

Table 4-53
Timing Limitation – Greater Sage-Grouse – Winter Range* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	50,791	8,613	3,050	39,129
Federal Minerals	103,553	16,168	7,260	80,125

*Table 2-2 Cross Reference: Special Status Species, Management Action 11.

Surface use would be prohibited from March 1 to June 30 in sage-grouse brood rearing/nesting habitat within two miles of a lek (Table 4-54). This would present a time delay and inconvenience to companies drilling new wells.

Table 4-54
Timing Limitation – Greater Sage-Grouse Brood Rearing/Nesting Habitat –Two Mile Buffer from Lek* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	46,139	7,277	1,319	37,543
Federal Minerals	97,434	13,883	5,267	78,284

*Table 2-2 Cross Reference: Special Status Species, Management Action 13.

Currently, acres within 1/4 mile of piping plover habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This stipulation is shown in Table 2-2 as Management Action 29 under Special Status Species.

Currently, acres within 1/4 mile of interior least tern habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This stipulation is shown in Table 2-2 as Management Action 31 under Special Status Species.

An NSO stipulation would apply within 1/4 mile of designated reservoirs with fisheries. This stipulation does not limit drilling in large contiguous blocks. Impacts to oil and gas development would be minor; in most cases, wells could be drilled in locations adjacent to these restricted areas. Acres affected would be as shown in Table 4-55.

Table 4-55
NSO – Fisheries – 1/4 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	551	0	0	551
Federal Minerals	12,548	2	336	12,210

*Table 2-2 Cross Reference: Aquatics and Fisheries, Management Action 4.

Paleontology: On occasion, paleontological surveys would be required. Most paleontological sites that are found could be avoided with minor impacts to leasable mineral development.

Visual Resources: Small numbers of acres with VRM Class II and III designations would have a negligible adverse effect on leasable minerals development. Class II designated lands fall within the areas of 'Very Low' and 'None' RFDs.

Locatable and Salable Minerals: Activities associated with locatable and salable minerals would impact leasable mineral projects and potential, depending on the amount, location, and type of disturbance. At the present time, these impacts are expected to be minor.

Impacts under Alternative B

Withdrawn from Mineral Entry: The 6,574 acre Fort Meade ACEC would be designated as No Lease.

Water Resources: Acres protected through an NSO floodplain stipulation would be higher than Alternative A (Table 4-45). Compared to Alternative A, Alternatives B, C and D would protect an additional 17,090 acres of BLM-administered surface estate and an additional 82,743 acres of mineral estate as a 300 foot NSO buffer would be required around riparian areas, floodplains, wetlands, riparian areas and waterbodies. Total acres protected would be 30,169 acres of surface estate and 146,169 acres of mineral estate.

Soil Resources: A Controlled Surface Use stipulation would apply and an engineering and reclamation plan would be required on acreages with a 25 percent slope or greater as shown in Table 4-56.

Table 4-56
CSU – 25 Percent Slope* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	14,061	178	285	13,598
Federal Minerals	62,890	1,258	1,434	59,516

*Table 2-2 Cross Reference: Soils, Management Action 1.

A Controlled Surface Use stipulation would apply, and an engineering and reclamation plan would be required on acreages of sensitive soils defined as soils with low restoration potential and low fugitive dust resistance. Acreages affected are shown in Tables 4-57, 4-58 and 4-59.

Table 4-57
CSU – Sensitive Soils; Low Restoration Potential* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	34,601	4,964	873	28,763
Federal Minerals	211,808	12,754	11,440	187,499

*Table 2-2 Cross Reference: Soils, Management Action 3.

Table 4-58
CSU – Sensitive Soils; Low Fugitive Dust Resistance* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	11,353	911	1,751	8,690
Federal Minerals	106,035	3,359	14,533	87,847

*Table 2-2 Cross Reference: Soils, Management Action 3.

Table 4-59
CSU – Sensitive Soils; Combined Low Restoration Potential and Low Fugitive Dust Resistance* (Acres[1])

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	45,954	5,875	2,624	37,453
Federal Minerals	268,435	13,020	19,606	235,513

[1]Some acres may overlap.
*Table 2-2 Cross Reference: Soils, Management Action 3.

Wildlife, Including Special Status Species, and Aquatic and Fisheries Resources: Alternative B would result in 19 fewer wells than Alternative A. For acres affected, see Table 4-47, NSO – Sharp-tailed Grouse and Greater Prairie-Chicken Lek (1/4 Mile Buffer) (Table 2-2 Cross Reference: Wildlife, Management Action 2).

A Timing Limitation stipulation would apply to sharp-tailed grouse and greater prairie-chicken nesting habitat that is within a two mile radius of a lek and includes a limit on surface disturbance that applies to individual leks. Acres affected are shown in Table 4-60. This stipulation is listed as Wildlife, Management Action 4.

Table 4-60
Timing Limitation – Sharp-tailed Grouse and Greater Prairie-Chicken Nesting; – Two Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	1,316	579	101	653
Federal Minerals	15,378	3,839	443	11,094

*Table 2-2 Cross Reference: Wildlife, Management Action 4.

An NSO stipulation would apply within designated bighorn sheep habitat (Table 4-61). The NSO for bighorn sheep would be located in low to very low, and very near some moderate oil and gas conventional development RFD potential areas. Impacts to oil and gas development from this stipulation are unlikely to occur because of the low development potential. Bighorn sheep range is shown in Map 2-3. The oil and gas conventional development potential areas are shown in Figure 4-1.

Table 4-61
NSO – Bighorn Sheep Habitat* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	788	0	0	788
Federal Minerals	58,072	0	1,804	56,265

*Table 2-2 Cross Reference, Wildlife, Management Action 12.

A Timing Limitation stipulation would apply to big game winter range between December 1 and March 31. For acres affected, see Table 4-49, *Timing Limitation – Big Game Winter Range (*Table 2-2 Cross Reference: Wildlife, Management Action 8).

An NSO stipulation would protect raptor nests (raptors that are not threatened or endangered, nor special status species) with a 1/4 mile buffer. Acres affected are shown in Table 4-62.

Table 4-62
NSO – Raptor Nests (raptors that are not T&E, nor special status species); 1/4 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	544	0	146	398
Federal Minerals	3,059	62	255	2,741

*Table 2-2 Cross Reference: Wildlife, Management Action 10.

An NSO stipulation would be used to protect bald eagle nesting by not allowing any wells to be located within 1/4 mile. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. This stipulation would affect acreages as shown in Table 4-63.

Table 4-63
NSO – Bald Eagle Nests; 1/4 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	0	0	0	0
Federal Minerals	80	0	0	80

*Table 2-2 Cross Reference: Special Status Species, Management Action 1.

An NSO stipulation would be used to protect peregrine falcon nesting by not allowing wells to be located within 1/2 mile. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. Currently, there are no acreages on public surface or public minerals within a 1/2 mile buffer of any peregrine falcon nesting sites. Until some nests are found, there would be no effect on oil and gas development in this alternative. This stipulation is listed as Special Status Species 4.

An NSO stipulation would be used to protect sensitive raptor nesting sites, including golden eagles, by not allowing any wells to be located within a distance of 1/4 mile. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. For acres affected, see Table 4-64, *NSO – Sensitive Raptor Nests – 1/4 Mile Buffer (does not include raptors that are listed as threatened or endangered) (*Table 2-2 Cross Reference: Special Status Species, Management Action 6).

Table 4-64
NSO – Sensitive Raptor Nests – 1/4 Mile Buffer*
(does not include raptors that are listed as threatened or endangered) (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	499	73	155	271
Federal Minerals	7,510	1,623	923	4,964

*Table 2-2 Cross Reference: Special Status Species, Management Action 6.

An NSO stipulation would apply within 1/2 mile of sage-grouse leks outside the PPAs in the GHAs. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. This stipulation would affect acreages as shown in Table 4-65.

Table 4-65
NSO – Greater Sage-Grouse Leks Stipulation Outside PPAs in GHAs;
1/2 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	509	0	0	509
Federal Minerals	2,072	0	73	2,000

*Table 2-2 Cross Reference: Special Status Species, Management Action 9.

Surface use would be prohibited from December 1 to March 31 in crucial winter range for sage-grouse. This would present a time delay and inconvenience to companies drilling new wells. For acres affected, see Table 4-53, *Timing Limitation Stipulation – Greater Sage-Grouse- Winter Range (*Table 2-2 Cross Reference: Special Status Species, Management Action 11).

Surface use would be prohibited from March 1 to July 15 in sage-grouse nesting habitat within three miles of a lek (Table 4-66) outside the PPAs in the GHAs. This would present a time delay and inconvenience to companies drilling new wells.

Table 4-66
Timing Limitation – Greater Sage-Grouse Brood Rearing/Nesting Habitat
Outside PPAs; Three Mile Buffer from Leks* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	14,749	844	1,942	11,963
Federal Minerals	31,522	2,283	4,163	25,076

*Table 2-2 Cross Reference, Special Status Species, Management Action 13.

A CSU stipulation would require that all new fiber optic, telephone, or power lines must be buried or sited to have the least impacts within one mile of sage-grouse leks in sage-grouse winter range and outside of PPAs in GHAs. This would result in a greater expense for oil and gas development on a moderate number of acres.

Greater Sage-Grouse PPAs would be leased subject to NSO stipulations. This would create greater expense because wells would need to be drilled directionally or horizontally to access fluid minerals in PPAs, and areas beyond the reach of such drilling would not be accessed and precluded from development. This alternative would subject a moderate number of acres to restrictions developed for PPAs for the protection of sage-grouse (see Table 4-67 for the number of acres). This stipulation is summarized in Management Action 20 in the Special Status Species section of Table 2-2. The stipulation is shown in detail in Appendix E.2.

Table 4-67
NSO – Greater Sage-Grouse PPAs in Alternatives B and D* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	83,744	18,358	2,336	63,050
Federal Minerals	253,357	37,618	9,028	206,711

*Table 2-2 Cross Reference, Special Status Species, Management Action 20.

The CSU requirement to bury existing power lines or provide anti-perch devices on public lands within PPAs would adversely affect oil and gas resources.

Currently, acres within 1/4 mile of piping plover habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This stipulation is summarized in Table 2-2, Special Status Species, Management Action 29, and is described in detail in Appendix E.2.

Currently acres within 1/4 mile of interior least tern habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This stipulation is summarized in Table 2-2, Special Status Species, Management Action 31, and is described in detail in Appendix E.2.

An NSO stipulation would apply within 1/4 mile of designated reservoirs with fisheries. For acres affected, see Table 4-55 *NSO – Fisheries; 1/4 Mile Buffer (*Table 2-2 Cross Reference: Aquatics and Fisheries, Management Action 4).

Paleontological Resources: Under Alternative B, a paleontological survey would be required in sites with Potential Fossil Yield Classes (PFYC) Class 4 and 5 geologic formations (refer to Map 2-7 and Table 2-2, Paleontology Section, Management Action 1). In most cases, important fossil sites could be avoided with minor impacts to leasable mineral development. Paleontological survey costs prior to leasable mineral development would be higher than Alternative A, which requires surveys on a case-by-case basis. Survey costs would be similar to Alternative C as the requirements are similar and lower than Alternative C, which requires surveys in PFYC Classes 3-7.

Visual Resources: Small numbers of acres with VRM Class II and III designations, and large acreage in Class IV, would have a negligible adverse effect on leasable minerals development. Class II designated lands fall within area of 'Very Low' and 'None' RFDs.

Recreation: An NSO stipulation within 1/2 mile of designated SRMAs would have a negligible effect on leasable minerals.

Lands and Realty: Burial of power lines would increase costs to leasable mineral mining companies. Greater Sage-Grouse PPAs would be ROW exclusion areas and would increase costs of leasable mineral development.

Locatable and Salable Minerals: Activities associated with locatable and salable minerals could impact leasable mineral projects and potential, depending on the amount, location, and type of disturbance.

Renewable Energy: Activities associated with renewable energy would impact leasable mineral projects and potential, depending on the amount, location, and type of disturbance.

Public Safety: A Minuteman Missile Site restriction would have a negligible adverse effect because it would limit access to negligible acreage (less than 100 acres).

Impacts under Alternative C

Withdrawn from Mineral Entry: The area designated as No Lease would total 309,576 acres; comprised of the Fort Meade ACEC, Fossil Cycad ACEC, Bear Butte (410 acres of federal minerals), Black Hills Army Depot (12,709 acres of federal minerals), and Greater Sage-Grouse PPAs (93,266 acres of BLM-administered surface, 289,563 acres of federal oil and gas minerals).

Water Resources: Compared to Alternative A, Alternatives B, C and D would protect an additional 17,090 acres of BLM-administered surface estate and an additional 82,743 acres of mineral estate as a 300 foot NSO buffer would be required around riparian areas, floodplains, wetlands, riparian areas, and waterbodies. Total acres protected would be 30,169 acres of surface estate and 146,169 acres of mineral estate.

Soil Resources: An NSO stipulation would apply to soils with slopes 25 percent or greater. Affected acres are the same as shown in Alternative B, Table 4-56 (CSU version).

An NSO stipulation would apply to sensitive soils, which are defined as having low restoration potential and low fugitive dust resistance. Acres affected would be the same as in the Alternative B, Tables 4-57, 4-58, and 4-59 (CSU versions).

Wildlife, Including Special Status Species, and Aquatic and Fisheries Resources: Alternative C includes Greater Sage-Grouse PPAs, with 37,618 acres in the High RFD. Alternative C would result in 51 fewer wells than Alternative A.

An NSO stipulation would protect sharp-tailed grouse and greater prairie-chicken leks with a 1/2 mile buffer. Acres affected are shown in Table 4-68.

Table 4-68
NSO – Sharp-tailed Grouse and Greater Prairie-Chicken Lek; 1/2 Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	27	24	0	3
Federal Minerals	805	118	0	687

*Table 2-2 Cross Reference: Wildlife, Management Action 2.

For Alternative C only, the Timing Limitation stipulation for sharp-tailed grouse and greater prairie-chicken nesting is for a three mile buffer. Acres affected are shown in Table 4-69.

Table 4-69
Timing Limitation – Sharp-tailed Grouse and Greater Prairie-Chicken Nesting; Three Mile Buffer* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	2,736	731	138	1,868
Federal Minerals	34,605	7,289	2,616	24,698

*Table 2-2 Cross Reference: Wildlife, Management Action 4.

The application of the two Controlled Surface Use Management Actions, “10 Foot High Structures” and “Bury Power Lines” for Sharp-tailed Grouse and Greater Prairie-Chicken Nesting – Two Miles, results in acreages that are the same as those in Table 4-48 (Table 2-2 Cross Reference: Wildlife, Management Actions 6 and 7).

A Timing Limitation stipulation would apply to big game winter range between December 1 and March 31. For acres affected, see Table 4-49, *Timing Stipulation – Big Game Winter Range (*Table 2-2 Cross Reference: Wildlife, Management Action 8).

An NSO stipulation would protect the nests of raptors that are not special status species with a 1/2 mile buffer. Acreages affected are shown in Table 4-70.

Table 4-70 NSO – Raptor Nests (raptors that are not special status species); 1/2 Mile Buffer* (Acres)				
	Total (All RFDs)	***High RFD***	***Moderate RFD***	***Low to Very Low to None RFD***
Public Surface	2,258	0	372	1,887
Federal Minerals	13,674	267	862	12,544

*Table 2-2 Cross Reference: Wildlife, Management Action 10.

The management action and impacts to bighorn sheep range would be the same as Alternative B.

An NSO stipulation would be used to protect bald eagle nests by not allowing any wells to be located within 1/2 mile. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. For acres affected, see Table 4-50, *NSO – Bald Eagle Nests; 1/2 Mile Buffer (*Table 2-2 Cross Reference: Special Status Species, Management Action 1).

An NSO stipulation would be used to protect peregrine falcon nesting by not allowing any wells to be located within a one-mile distance. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. Currently, there are no acreages on public surface or public minerals within a one mile buffer of any peregrine falcon nesting sites. Until some nests are found, there would be no effect on oil and gas development in this alternative. This stipulation is listed as Special Status Species 4.

An NSO stipulation would be used to protect sensitive raptor species, including golden eagles, by not allowing any wells to be located within 1/2 mile of a nest site. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. For acres affected, see Table 4-51, *NSO – Sensitive Raptor Nests – 1/2 Mile Buffer (does not include raptors that are listed as threatened or endangered) (*Table 2-2 Cross Reference: Wildlife, Management Action 6).

An NSO stipulation would apply within designated bighorn sheep habitat. Affected acres are shown in Table 4-61 (Table 2-2 Cross Reference: Wildlife, Management Action 12).

An NSO stipulation would apply within one mile of sage-grouse leks outside PPAs in the GHA. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. This stipulation would affect acreages shown in Table 4-71.

Table 4-71 NSO – Greater Sage-Grouse Leks in GHAs; One Mile Buffer in Alternative C* (Acres)				
	Total (All RFDs)	***High RFD***	***Moderate RFD***	***Low to Very Low to None RFD***
Public Surface	767	182	0	585
Federal Minerals	1,846	214	561	1,149

*Table 2-2 Cross Reference: Special Status Species, Management Action 9.

Surface use would be prohibited from December 1 to March 31 in crucial winter range for sage-grouse. This would present a time delay and inconvenience to companies drilling new wells and maintaining and producing from existing wells. For affected acres, see Table 4-53, *Timing Stipulation – Greater Sage-Grouse- Winter Range (*Table 2-2 Cross Reference: Special Status Species, Management Action 11).

Surface use would be prohibited from March 1 to July 15 in sage-grouse nesting habitat within four miles of a lek outside the PPAs in the GHAs. Affected acres are shown in Table 4-72. This would present a time delay and inconvenience to companies drilling new wells and maintaining and producing from existing wells.

Table 4-72 Timing Limitation – Greater Sage-Grouse Brood Rearing/Nesting Habitat Outside PPAs in GHAs; Four Mile Buffer from Leks* (Acres)				
	Total (All RFDs)	**High RFD**	**Moderate RFD**	**Low to Very Low to None RFD**
Public Surface	19,928	4,989	2,848	12,089
Federal Minerals	60,528	14,101	7,705	38,722

*Table 2-2 Cross Reference: Special Status Species, Management Action 13.

All new fiber optic, telephone, or power lines must be buried within two miles of sage-grouse leks and within sage-grouse winter range outside the PPAs in the GHAs. This would result in greater expense on a moderate to large number of acres.

Oil and gas leasing would not be allowed in the Greater Sage-Grouse PPAs. This would preclude the opportunity to develop fluid minerals in the PPA core areas. Affected acres are shown in Table 4-73.

Table 4-73 Closed (No Lease) – Greater Sage-Grouse PPAs in Alternative C* (Acres)				
	Total (All RFDs)	***High RFD***	***Moderate RFD***	***Low to Very Low to None RFD***
Public Surface	93,266	18,358	2,336	72,572
Federal Minerals	289,563	37,618	9,028	242,917

*Table 2-2 Cross Reference: Special Status Species, Management Action 19.

A closure of oil and gas minerals in Greater Sage-Grouse PPAs would create oil and gas drainage issues that would be difficult to address. Given the intermingled nature of public and private lands and mineral estate a company could access oil or gas by drilling on private lands adjacent to or within the PPAs. In this case, the revenue that is drained from federal minerals in the PPAs would not be collected by the federal government and would be lost with little benefit to sage-grouse. Under the NSO stipulation that is provided in Alternatives B and D, revenue from federal mineral estate that is drained by a well located on private surface/private minerals could be collected and the impacts to sage-grouse would be similar to a closure.

The CSU requirement to bury existing power lines or provide anti-perch devices on public lands within PPAs would increase costs of oil and gas development but would likely not reduce development in high to moderate potential areas.

Currently, acres within 1/4 mile of piping plover habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This stipulation is summarized in Table 2-2, Special Status Species, Management Action 24, and described in detail in Appendix E.3.

Currently, acres within 1/4 mile of interior least tern habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This stipulation is summarized in Table 2-2, Special Status Species, Management Action 26, and described in detail in Appendix E.3.

An NSO stipulation would apply within 1/4 mile of designated reservoirs with fisheries. For acres affected, see Table 4-55, *NSO – Fisheries; 1/4 Mile Buffer (*Appendix E.3 Cross Reference: Aquatics and Fisheries, Management Action 4).

Cultural Resources and Traditional Cultural Properties: The discretionary No Lease decision for 410 acres of federal minerals beneath Bear Butte would have a negligible adverse effect on leasable minerals.

Paleontological Resources: The requirement to survey a very large number of sites, as well as monitoring them for paleontological resources, would increase costs the greatest to oil and gas and other leasable minerals companies. Under Alternative C, a paleontological survey would be required in sites with Potential Fossil Yield Classes (PFYC) Classes 3 - 5 (refer to Map 2-7 and Table 2-2, Paleontology Section, Management Action 1). In many cases, important fossil sites could be avoided with minor impacts to leasable mineral development, but the requirements for surveys of larger areas combined with additional monitoring could result in more cases where development of leasable minerals is affected. Overall costs to leasable mineral development would be highest under Alternative C.

Visual Resources: Large numbers of acres with VRM Class II and III designations, and a large acreage in Class IV, would have a moderate adverse effect on leasable minerals development. Class II designated lands fall within the area of 'Very Low' and 'None' RFDs.

Recreation: An NSO stipulation within one mile of designated SRMAs would have a negligible adverse effect on leasable minerals due to small acreages affected.

Lands and Realty: Burial of all power lines would increase costs the most to leasable mineral mining companies. Greater Sage-Grouse PPAs would be ROW exclusion areas and would increase costs of leasable mineral development.

Locatable and Salable Minerals: Activities associated with locatable and salable minerals would impact leasable mineral projects and potential depending on the amount, location, and type of disturbance. At the present time, the impacts are expected to be minor.

Renewable Energy: Activities associated with renewable energy would impact leasable mineral projects and potential, depending on the amount, location, and type of disturbance.

Public Safety: A Minuteman Missile Site restriction would have a negligible adverse effect because it would limit access to acreages less than 100 acres.

Special Designations: The designation of a sage-grouse PPA ACEC along with a closure of oil and gas leasing in PPAs would result in a shift of this use to areas adjacent to private lands with private minerals and non-federal lands and also onto BLM-administered lands adjacent to the ACEC.

Impacts under Alternative D (Preferred Alternative)

Withdrawn from Mineral Entry: The areas designated as No Lease would total 7,304 acres comprised of the Fort Meade ACEC and Fossil Cycad ACEC, and include a new designation (410 acres) of federal minerals beneath Bear Butte.

Water Resources: Compared to Alternative A, Alternatives B, C and D would protect an additional 17,090 acres of BLM-administered surface estate and an additional 82,743 acres of mineral estate as a 300 foot NSO buffer would be required around riparian areas, floodplains, wetlands, riparian areas, and waterbodies. Total acres protected would be 30,169 acres of surface estate and 146,169 acres of mineral estate.

Soil Resources: A CSU stipulation on slopes 25 percent to 50 percent would apply the same as in Alternative B. An NSO stipulation on slopes greater than 50 percent would apply the same as in Alternative C. These stipulations would apply on acreages shown in Table 4-74 below.

Table 4-74
Slope Restrictions (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
CSU – 25-50 Percent Slope*				
Public Surface	13,121	163	254	12,705
Federal Minerals	59,642	1,172	1,318	56,534
NSO – 50 or Greater Percent Slope*				
Public Surface	924	15	31	878
Federal Minerals	3,248	87	116	2,980

*Table 2-2 Cross Reference: Soils, Management Action 1.

CSU stipulations for sensitive soils would apply the same as in Alternative B.

Wildlife, Including Special Status Species, and Aquatic and Fisheries Resources: Alternative D includes Greater Sage-Grouse PPAs, with 37,618 acres in the High RFD. Alternative D would result in 19 fewer wells than alternative A. For affected acres, see Table 4-67 (*Table 2-2 Cross Reference, Special Status Species, Management Action 20).

An NSO stipulation would protect sharp-tailed grouse and greater prairie-chicken leks with a 1/4 mile buffer. For affected acres, see Table 4-47 (Table 2-2 Cross Reference, Wildlife, Management Action 2).

A Timing Limitation stipulation would apply to sharp-tailed grouse and greater prairie-chicken brood rearing/nesting habitat within a two mile radius of a lek and would limits surface disturbance within that area. Acres affected would be the same as in Table 4-60 (Table 2-2 Cross Reference, Wildlife, Management Actions 4, 6, and 7).

A CSU requirement to bury or site new power lines or provide anti-perch devices on public lands within 2 miles of sharp-tailed grouse and greater prairie-chicken leks would negatively affect oil and gas resources. For affected acres, see Table 4-60,*Timing Limitation – Sharp-tailed Grouse and Greater Prairie-Chicken Nesting; – Two-Mile Buffer. This stipulation is listed in Table 2-2 as Wildlife Management Action 7.

A Timing Limitation stipulation would limit drilling in big game winter range between December 1 and March 31. For acres affected, see Table 4-49 *Timing Limitation – Big Game Winter Range (*Table 2-2 Cross Reference, Wildlife, Management Action 8).

An NSO stipulation would protect raptor nest sites with a buffer. For acres affected, see Table 4-62, *NSO – Raptor Nests (raptors that are not special status species); 1/4 Mile Buffer (*Table 2-2 Cross Reference, Wildlife, Management Action 10).

An NSO stipulation would apply to designated bighorn sheep habitat. Affected acres are shown in Table 4-61. (*Table 2-2 Cross Reference, Wildlife, Management Action 12).

An NSO stipulation would be used to protect bald eagle nests by not allowing any wells to be located within a distance of 1/2 mile. This would necessitate relocating some well sites and may require some wells to be drilled as directional or horizontal wells, at greater expense. For acres affected, see Table 4-50, *NSO – Bald Eagle Nests; 1/2 Mile Buffer for acres (*Table 2-2 Cross Reference, Special Status Species, Management Action 1).

An NSO stipulation would be used to protect peregrine falcon nesting by not allowing any wells to be located within one mile. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. Currently, there are no acreages on public surface or public minerals within a one-mile buffer of any peregrine falcon nesting sites. Until some nests are found, there would be no effect on oil and gas development in this alternative. This stipulation is listed as Special Status Species 4 in Appendix E.4.

An NSO stipulation would be used to protect sensitive species raptors, including golden eagles, by not allowing any wells to be located within 1/4 mile (see Table 4-64). This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. This stipulation is listed in Table 2-2 under Special Status Species, Management Action 6; and is in Appendix E.4.

An NSO would apply within one mile of sage-grouse leks. This would necessitate relocating some well sites and may require some wells be drilled as directional or horizontal wells, at greater expense. Acres affected are shown in Table 4-75 below, *NSO Greater Sage-Grouse Leks; One Mile Buffer in Alternative D (*Table 2-2 Cross Reference, Special Status Species, Management Action 9).

Table 4-75
NSO – Greater Sage-Grouse Leks in GHAs; One Mile Buffer in Alternative D* (Acres)

	Total (All RFDs)	***High RFD***	***Moderate RFD***	***Low to Very Low to None RFD***
Public Surface	7,945	854	34	7,057
Federal Minerals	21,525	3,094	917	17,513

*Table 2-2 Cross Reference: Special Status Species, Management Action 9.

Surface use would be prohibited from December 1 to March 31 in crucial winter range for sage-grouse. This would present a time delay and inconvenience to companies drilling new wells. For acres affected, see Table 4-53, *Timing Limitation – Greater Sage-Grouse- Winter Range for acres (*Table 2-2 Cross Reference, Special Status Species, Management Action 11).

Surface use would be prohibited from March 1 to July 15 in sage-grouse brood rearing/nesting habitat within four miles of a lek within the GHA. Acres affected are shown in Table 4-76. This would present a time delay and inconvenience to companies drilling new wells and maintaining and producing from existing wells.

Table 4-76
Timing Limitation – Greater Sage-Grouse Brood Rearing/Nesting Habitat Outside PPAs; Four Mile Buffer from Leks* (Acres)

	Total (All RFDs)	*High RFD*	*Moderate RFD*	*Low to Very Low to None RFD*
Public Surface	29,360	4,989	2,848	21,523
Federal Minerals	65,846	14,101	7,705	44,040

*Table 2-2 Cross Reference, Special Status Species, Management Action 13.

A CSU stipulation would require that all new fiber optic, telephone, or power lines must be buried or sited to have the least impacts within two miles of sage-grouse leks and within sage-grouse winter range and outside of PPAs in GHAs. This would result in greater expense on a moderate to large number of acres. (Cross Reference, Special Status Species, Management Action 15).

Greater Sage-Grouse PPAs would be leased subject to a NSO stipulation, which would be more expensive since wells would need to be drilled directionally or horizontally to access fluid minerals in PPAs, and areas beyond the reach of such drilling would not be accessed and precluded from development. The acres affected by Greater Sage-Grouse PPAs would be the same as Alternative B, which would subject a moderate number of acres to the restrictions developed for PPAs for the protection of sage-grouse. For acres affected, see Table 4-67, *NSO – Greater Sage-Grouse PPAs in Alternatives B and D (*Table 2-2 Cross Reference, Special Status Species, Management Action 19).

A CSU requirement to bury existing power lines or provide anti-perch devices on public lands within sage-grouse general habitat, PPAs, and sage-grouse winter range would negatively affect oil and gas resources. Acres affected would vary depending on site-specific circumstances. This stipulation is listed in Table 2-2 as Special Status Species Management Action 15 and 24, and can be found in Appendix E.4.

Currently, acres within 1/4 mile of piping plover habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This is Special Status Species, Management Action 29 in Table 2-2 and in Appendix E.4.

Currently acres within 1/4 mile of interior least tern habitat are unavailable since they continually change, so effects to fluid minerals cannot be enumerated. This is Special Status Species, Management Action 31 in Table 2-2 and Appendix E.4.

An NSO stipulation would apply within 1/4 mile of designated reservoirs with fisheries. For affected acres, see Table 4-55, *NSO – Fisheries; 1/4 Mile Buffer (*Table 2-2 Cross Reference, Fisheries and Aquatics, Management Action 4).

Cultural Resources and Traditional Cultural Properties: The discretionary No Lease decision for 410 acres of federal minerals beneath Bear Butte would have a negligible adverse effect on leasable minerals.

Paleontological Resources: Impacts would be the same as Alternative B.

Visual Resources: A small numbers of acres with VRM Class II and III designations, and a large acreage in Class IV, would have a small negative effect on leasable minerals development. Class II designated lands fall within the area of ‘Very Low’ and ‘None’ RFDs.

Recreation: An NSO stipulation within 1/2 mile of designated SRMAs would have a negligible adverse effect on leasable minerals.

Lands and Realty: Impacts would be the same as Alternative B.

Locatable and Salable Minerals: Activities associated with locatable and salable minerals could impact leasable mineral projects and potential, depending on the amount, location, and type of disturbance. At the present time, the impacts are expected to be minor.

Renewable Energy: Activities associated with renewable energy development could impact leasable mineral projects and potential, depending on the amount, location, and type of disturbance.

Public Safety: Impacts would be the same as Alternative C.

Cumulative Impacts

Cumulative Impacts under Alternative A (Current Management)

Restrictions create an effect to oil and gas leasing and subsequent development ranging from minor (timing stipulations) to the most restrictive measure of completely preventing development in a given area. In turn, restrictions lead to less federal acreage being leased which equates to a reduction in oil and gas exploration and development on federal minerals, a reduction in federal wells drilled, and ultimately a reduction in federal oil and gas produced. The federal mineral estate that is available or unavailable for leasing is shown in Table 4-77.

Table 4-77
Cumulative Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing

	RFD Level	*Alternative A (Current Management)*		*Alternative B*		*Alternative C*		*Alternative D (Preferred Alternative)*	
		Surface	*Subsurface*	*Surface*	*Subsurface*	*Surface*	*Subsurface*	*Surface*	*Subsurface*
Cumulative Acres Available for Oil and Gas Leasing									
No Surface Occupancy	High	3,688	8,050	20,741	45,700	3,590	15,084	20,860	45,169
	Moderate	732	3,731	2,801	16,585	2,106	20,725	2,809	16,830
	Low	5,305	18,365	38,145	121,247	9,592	53,891	38,316	120,985
	Very Low	5,470	55,700	38,954	206,375	23,852	239,620	39,787	208,259
	None	294	1,463	5,196	14,358	4,757	25,597	5,253	14,721
	Not Assessed	0	40	0	41	0	479	0	41
Timing Limitations	High	13,670	35,627	4,236	14,600	5,471	19,676	6,271	23,101
	Moderate	3,524	17,925	2,750	12,873	1,735	10,332	3,119	17,580
	Low	28,929	81,133	8,370	35,883	8,153	28,905	10,918	45,891
	Very Low	67,103	307,660	45,360	237,570	29,919	182,414	46,084	249,874
	None	1,978	7,638	470	4,596	558	3,325	429	4,454
	Not Assessed	0	49	0	48	0	37	0	48
Controlled Surface Use	High	42	379	290	3,336	0	0	260	2,921
	Moderate	68	442	367	9,880	0	0	248	7,517
	Low	219	1,706	1,305	18,354	0	0	1,190	14,519
	Very Low	1,239	12,415	7,450	114,795	768	768	7,199	109,703
	None	1,386	4,582	1,149	11,712	767	767	1,134	11,491
	Not Assessed	0	89	0	424	0	0	0	423

Table 4-77
Cumulative Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing

	RFD Level	*Alternative A (Current Management)*		*Alternative B*		*Alternative C*		*Alternative D (Preferred Alternative)*	
		Surface	*Subsurface*	*Surface*	*Subsurface*	*Surface*	*Subsurface*	*Surface*	*Subsurface*
Standard Lease Terms	High	13,372	43,195	5,505	23,615	3,353	14,873	3,381	16,060
	Moderate	2,531	32,874	937	15,634	678	11,777	679	13,045
	Low	21,607	127,177	8,240	52,897	5,433	45,760	5,636	46,986
	Very Low	60,910	558,346	42,958	375,381	40,493	358,218	41,652	365,875
	None	4,613	36,275	1,776	19,612	2,189	20,269	1,455	19,292
	Not Assessed	0	823	0	488	0	485	0	489
Cumulative Acres Unavailable for Oil and Gas Leasing									
Non-discretionary		National parks, wildlife refuges, wilderness areas, and incorporated cities and towns		National parks, wildlife refuges, wilderness areas, and incorporated cities and towns		National parks, wildlife refuges, wilderness areas, and incorporated cities and towns		National parks, wildlife refuges, wilderness areas, and incorporated cities and towns	
Discretionary		Fort Meade and Fossil Cycad ACECs		Fort Meade ACEC		SG PPAs, BHAD, Fort Meade and Fossil Cycad ACECs, and Bear Butte		Fort Meade and Fossil Cycad ACECs, and Bear Butte	
Total Acres Closed	High	--	--	--	--	18,358	37,618	--	--
	Moderate	--	--	--	--	2,336	12,138	--	--
	Low	--	--	--	--	32,882	99,825	--	--
	Very Low	6,376	6,424	6,376	6,424	46,066	159,525	6,376	6,834
	None	518	645	198	325	518	645	518	645
	Not Assessed	--	--	--	--	--	--	--	--

[1] - Acreages by subcategory were calculated such that each column of subcategories under each alternative adds up to the total available acres for leasing based on the following general concepts where multiple stipulations overlapped: Unavailable land categories override available land categories. Within available lands, NSO stipulations override and are more restrictive than Timing Limitations, Controlled Surface Use, and Standard Lease Terms. Timing Limitation stipulations override and are more restrictive than Controlled Surface Use and Standard Lease Terms. Controlled Surface Use stipulations override and are more restrictive than Standard Lease Terms.
[2]- BLM-administered surface acres with federal minerals lands underneath.

Approximately 524 additional oil and gas wells would be drilled during the life of the RMP. Of these, 75 would be coalbed natural gas wells, leaving 449 conventional oil and gas wells. Of the conventional oil and gas wells, 94 wells would access federal minerals (plus four on coalbed natural gas wells). See Table 4-5, Potential Surface Disturbance from Oil and Gas Drilling, for an enumeration of short- and long-term disturbances on federal minerals and on BLM-managed public surface. Decreases in oil and gas production are approximated to be proportional to the decreases in numbers of wells. Coalbed gas production decreases would not likely occur since coalbed gas wells are unlikely to be located in Greater Sage-Grouse PPAs.

Cumulative Impacts under Alternative B

Restrictions create an effect to oil and gas leasing and subsequent development, ranging from a minor restriction such as a timing stipulation to the most restrictive measure of completely preventing development in a given area. In turn,

restrictions lead to less federal acreage being leased which equates to a reduction in oil and gas exploration and development on federal minerals, a reduction in federal wells drilled, and ultimately a reduction in federal oil and gas produced.

See Table 4-77, Cumulative Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing in Cumulative Impacts under Alternative A.

Approximately 524 additional oil and gas wells would be drilled during the life of the RMP. Of these, 75 could be coalbed natural gas wells, leaving 449 conventional oil and gas wells. Of the conventional oil and gas wells, 75 wells would access federal minerals (plus four on coalbed natural gas wells on federal minerals). See Table 4-5 Potential Surface Disturbance from Oil and Gas Drilling, for short-term and long-term disturbances on federal minerals as well as on BLM-managed public surface. Decreases in oil and gas production would likely be proportional to the decreases in numbers of wells. Coalbed gas production decreases would likely not occur since coalbed gas wells are unlikely to be located in Greater Sage-Grouse PPAs.

Cumulative Impacts under Alternative C

Restrictions create an effect to oil and gas leasing and subsequent development, ranging from a minor restriction such as a timing stipulation to the most restrictive measure of completely preventing development in a given area. In turn, restrictions lead to less federal acreage being leased which equates to a reduction in oil and gas exploration and development on federal minerals, a reduction in federal wells drilled, and ultimately a reduction in federal oil and gas produced.

See Table 4-77, Cumulative Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing in Cumulative Impacts under Alternative A.

Approximately 524 additional oil and gas wells would be drilled during the life of the RMP. Of these, 75 could be coalbed natural gas wells, leaving 449 conventional oil and gas wells. Of the conventional oil and gas wells, 43 wells would access federal minerals (plus four on coalbed natural gas wells on federal minerals). See Table 4-5, Potential Surface Disturbance from Oil and Gas Drilling, for an enumeration of short-term and long-term disturbances on federal minerals, as well as on BLM managed public surface segregated out by itself. Decreases in oil and gas production can be assumed to be approximately proportional to the decreases in the numbers of wells in the referenced table. Coalbed gas production decreases would likely not occur since coalbed gas wells are unlikely to be located in Greater Sage-Grouse PPAs.

Special Designations: The designation of a sage-grouse PPA ACEC combined with a closure of oil and gas leasing would create a tendency for producers to move oil and gas production and change the placement of infrastructure from BLM administered lands to private lands/private minerals and non-federal lands within the PPA or in some cases to public or private lands adjacent to ACECs. Many areas within the PPAs that are already leased and producing would still be developed but some infrastructure would be placed on adjacent lands or private surface/minerals or on non-federal lands instead of on BLM administered lands in the PPA ACEC.

Cumulative Impacts under Alternative D

Restrictions create an effect to oil and gas leasing and subsequent development, ranging from a minor restriction such as a timing stipulation to the most restrictive measure of completely preventing development in a given area. In turn, restrictions lead to less federal acreage being leased which equates to a reduction in oil and gas exploration and development on federal minerals, a reduction in federal wells drilled, and ultimately a reduction in federal oil and gas produced.

See Table 4-77, Cumulative Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing in Cumulative Impacts under Alternative A.

Approximately 524 additional oil and gas wells would be drilled during the life of the plan. Of these, 75 could be coalbed natural gas wells, leaving 449 conventional oil and gas wells. Of the conventional oil and gas wells, 75 wells

would access federal minerals (plus four on coalbed natural gas wells on federal minerals). See Table 4-5, Potential Surface Disturbance from Oil and Gas Drilling, for an enumeration of short-term and long-term disturbances on federal minerals, as well as on BLM managed public surface. Decreases in oil and gas production can be assumed to be approximately proportional to the decreases in the numbers of wells in the referenced table. Coalbed gas production decreases would likely not occur since coalbed gas wells are unlikely to be located in Greater Sage-Grouse PPAs.

Locatable Minerals

Assumptions

Administration of locatable minerals on public lands would continue as required by law and regulation (43 CFR 3809). Most mineral commodities are currently at record high values when compared with values over the last 25 years. It is assumed commodity prices will fluctuate around the current price level or increase modestly over both the short and long term, with some potential for booms and busts which have been part of the history of mineral extraction.

Locatable mineral claims would primarily be filed for bentonite, gold, and uranium, with some potential for more cement grade limestone claims. Each mining claim covers an estimated 20 acres. Bentonite is exposed extensively in the planning area and contains the highest potential for development.

It is important to note that the Surface Management Regulations used to manage locatable mineral activity only apply to BLM-managed surface. Generally, the BLM does not regulate locatable mineral actions on private surface with one exception. The exception is in the case where the private surface owner who owns land patented under the Stock Raising Homestead Act does not give permission to the claimant to conduct surface-disturbing operations. In that circumstance, the claimant must file a Plan of Operations with the BLM for approval. However, for analysis purposes we will assume that only BLM-managed lands within the RFD are subject to mineral location, exploration and development.

Reasonably Foreseeable Development

RFD actions for minerals that are applicable to evaluation of potential impacts are set forth at the beginning of Chapter 4.

Impacts Common to All Alternatives

Where allowed, the BLM would continue to process, within the scope of all pertinent rules and regulations, Notices of Intents (NOIs) and Plans of Operations for locatable mineral exploration and development and would strive to ensure those activities are conducted in an environmentally responsible manner. This would require a commitment of BLM manpower and resources commensurate with a workload that is not possible to predict.

If valid mining claims were present within the subject lands and surface-disturbing or disruptive activities were proposed, it is likely these provisions of the regulations would apply: 43 CFR 3809 regulations only preclude surface-disturbing operations that cause unnecessary and undue degradation. (Unnecessary and undue degradation is defined as activities, conditions, or practices that fail to comply with performance standards found in 43 CFR 3809.420, the terms and conditions of an approved Plan of Operations, operations described in a complete Notice of Intent (NOI), and other state and federal laws related to environmental and cultural resource protection.) Regulations allow disturbance that is reasonable and necessary. In the absence of requirements imposed by state or federal law pertaining to the subject resource, it would not be possible to deny operations; however, it would be possible to impose reasonable mitigation measures to lessen impacts. This would cause additional expense and delay to the claimant or operator.

NOIs for actions that disturb less than five acres do not constitute a federal action, are not subject to federal approval, and a NEPA analysis is not conducted. The NOI is deemed acceptable by the BLM; the proposed activity, however, cannot cause unnecessary or undue degradation. NOIs in the planning area would mostly include exploratory drilling activity but could include small-scale sampling of less than 1,000 tons. The most common NOI activity in the planning area is bentonite exploratory drilling. This type of drilling is conducted using augers mounted on one- or two-ton trucks that travel over land from site to site. No additional roads or trails or surface disturbance (other than the auger hole)

occurs. Past activity has shown that this type of exploration is low impact and commonly accomplished without causing unnecessary and undue degradation.

Drilling could also occur for uranium exploration. Larger drill trucks similar to ones used for water well drilling would be required, along with support vehicles. This activity would cause additional surface damages and possible additional road or trail construction. Either an NOI or a Plan of Operations may be required depending on the level of surface disturbance. A bond that covers 100 percent of the cost of reclamation, and reclamation of all surface-disturbing activity associated with an NOI is required; therefore, activities would be in conformance with BLM reclamation requirements.

A disturbance of any size proposed within a SRMA (such as an ACEC), surface-disturbing operations in lands or waters known to contain federally proposed or listed threatened and endangered species (or their habitat), or any proposed surface disturbance greater than five acres, requires a Plan of Operations which is submitted to BLM for approval. Detailed operations and reclamation plans are required and a NEPA analysis and public review of the Plan of Operations or environmental document would be conducted. As a result, resource values and impacts would be studied and documented. Additionally, comprehensive reclamation plans that satisfy BLM requirements are incorporated into the Plan of Operations. Claimants would have a right to develop their minerals under current law. Mineral development must be allowed unless unnecessary and undue degradation would occur. Impacts would usually be mitigated so unnecessary and undue degradation does not occur. Compliance with other pertinent laws and regulations is required. Reclamation of all surface-disturbing activity associated with a Plan of Operations would be required along with a bond that covers 100 percent of the cost of reclamation.

The surface management regulations only apply to federally-owned surface estate and some lands patented under the Stock Raising Homestead Act (under certain conditions). The surface management regulations do not apply to acquired lands (such as those acquired under the Bankhead-Jones Act). Mining claims cannot be located on acquired lands; subsequently, the minerals would be administered as non-energy leasable minerals.

Wildlife: Management actions incorporating guidelines from the National Sage-Grouse Habitat Conservation Strategy would alter proposed mine reclamation plans in areas that are located in sage-grouse habitat.

Locatable mineral NOIs and Plans of Operations must be in compliance with state and federal laws for protection of threatened and endangered species to prevent unnecessary and undue degradation. For other actions protecting species or their habitats, operators must comply with other federal and state laws related to environmental protection and protection of threatened and endangered species. This would result in protective mitigation measures to avoid affecting protected threatened and endangered species or their habitat. If needed or appropriate, design features that benefit threatened and endangered species would be incorporated into mining and reclamation plans. If a particular special status species is protected by state or federal law, locatable mineral NOIs and Plans of Operations must be in compliance with those laws to prevent unnecessary and undue degradation.

The BLM would strive to comply with wildlife management agreements and plans in which the BLM is a signatory, partner, participant, or associate. Impacts would be reduced via special mitigation measures and project design features.

Water Resources: In riparian and wetland areas, Plans of Operations and state water quality laws would require sediment control in active mine areas. Smaller riparian areas would be mined if it could be done without causing unnecessary and undue degradation. NSO in floodplains would limit the mining of a few locatable minerals sorted by water, such as sand and gravel. In a few situations, it would place minor amounts of bentonite off limits.

Noxious Weeds and Other Invasive Species: Operators would be required to control invasive species on BLM-administered lands in their areas of operations. Operators would be required to submit a Pesticide Use Proposal for authorization to control invasive species. Terms and conditions using BMPs would be applied to mining activities (within constraints of the mining law to meet land health standards, and protect water quality, air quality, soil resources, and plant and animal species).

Cultural Resources: For management actions protecting cultural resources, NOIs and Plans of Operations must be in compliance with federal and state laws pertaining to protection of cultural resources and environmental protection to prevent unnecessary and undue degradation. The BLM may impose reasonable mitigation measures to lessen impacts. This would result in delay, additional expense, and alteration of mining plans to the proponent. The management of

cultural resources would seldom prevent locatable minerals development, but to avoid disturbance to any cultural resource, a cultural inventory and possible relocation of exploration or mining development could occur. This relocation, as well as any additional mitigation under standard avoidance or recovery procedures, would create time delays and further expenses for locatable minerals development.

As required, the BLM would conduct consultation with Native American tribes on proposed locatable mineral actions. This could result in additional mitigation and expense to the claimant or operator.

Visual Resources: VRM issues would be addressed during site-specific NEPA analysis of Plans of Operations. Mitigation would be incorporated into approvals or Plans of Operations to lessen effects on visual resources. If VRM requirements, such as painting, would be implemented, it would increase costs to the claimant or operator. It is not anticipated that impacts to visual resources would result in unnecessary or undue degradation, which would warrant restrictions, although in the case of Native American TCPs, that possibility would be slightly elevated.

Leasable and Salable Minerals: Leasable or salable mineral conflicts with locatable mineral resource needs are not anticipated. The planning area's primary locatable mineral development area would not be located within an area that has coal development potential or current oil and gas activity. If a conflict should ever develop between developers of various minerals, resolution of the conflict would be left primarily to the claimants, lease holders, permit holders, and mineral developers. Recreational gold panning would be restricted if monitoring determined adverse effects to resources.

Lands and Realty (ROWs): Burial of power lines would place added costs on companies using electrical power in their operations.

Fire Management and Ecology: Management of fire and fuels could temporarily result in restricted access to a mining project during implementation of a prescribed burn or wildfire suppression.

Impacts under Alternative A (Current Management)

Withdrawn from Mineral Entry: The area withdrawn from mineral entry would be 6,894 acres comprised of the Fort Meade ACEC and Fossil Cycad ACEC.

Paleontological Resources: The BLM would strive to protect significant paleontological resources using surveys in formations with high potential for fossils from NOIs or Plans of Operations surface-disturbing activities. Project denial would not be a viable option unless it would be demonstrated that unnecessary and undue degradation would occur. Excavation would be used to mitigate some impacts where necessary, which would result in additional delay and expense to the operator or claimant. This would affect only small areas of public surface.

Impacts under Alternative B

Withdrawn from Mineral Entry: The area withdrawn from mineral entry would be 7,304 acres, comprised of the Fort Meade ACEC, Fossil Cycad ACEC, and Bear Butte National Historic Landmark.

Recreation (Gold Panning): Potentially up to 20 acres may be withdrawn from mineral entry to be used for recreational gold panning, which would provide some enjoyment to the public for limited periods of time. Those acres would be placed off limits to claiming under locatable minerals law. The areas would remain open to the public for casual use (refer to Glossary) gold panning.

Paleontological Resources: The BLM would strive to protect significant paleontological resources using paleontological surveys in formations with high potential for fossils from NOIs or Plans of Operations surface-disturbing activities. Project denial would not be a viable option unless it could be demonstrated that unnecessary and undue degradation would occur. Excavation would be used to mitigate some impacts, where necessary, which would result in additional delay and expense to the operator or claimant. This would affect only moderately sized areas of public surface.

Wildlife: Management of wildlife resources and habitat outside special designations would seldom prevent locatable minerals development; however, to avoid significant impact to wildlife, special conditions and possible relocation of exploration or mining development could occur. This relocation, as well as any additional mitigation, would create time delays and further expenses for locatable minerals development if the area is not closed to mineral entry through withdrawal. Certain areas for the special management of wildlife resources and habitat have been identified as areas within two miles of a sharp-tailed grouse or greater prairie-chicken lek where development would be limited.

Impacts under Alternative C

Withdrawn from Mineral Entry: The area withdrawn from mineral entry would be 296,867 acres comprised of the Fort Meade ACEC, Fossil Cycad ACEC, and Bear Butte National Historic Landmark (410 acres of federal minerals), and Greater Sage-Grouse PPAs (93,266 acres of BLM-administered surface, 289,563 acres of federal minerals). The withdrawal of minerals in the Fort Meade and Fossil Cycad ACECs would be a continuation of current management (same as Alternative A). The withdrawal of minerals in Bear Butte National Historic Landmark and the sage grouse PPAs would be new management. Withdrawal of minerals in Greater Sage-Grouse PPAs may increase or concentrate human use and infrastructure from BLM-administered lands onto private and non-federal lands or in some cases onto other lands adjacent to PPAs. Under Alternative C, extraction of bentonite deposits would still occur on BLM administered lands in PPAs, although mining companies would be more inclined to limit disturbance in PPAs and when possible, may site infrastructure and move secondary mining disturbance on to other lands adjacent to BLM-administered lands. Greater Sage-Grouse PPAs are shown in Map 2-5 and bentonite interest areas are shown in Map 2-8. The shifting or concentration of human use and infrastructure from BLM-administered lands onto private or non-federal lands within the Fort Meade and Fossil Cycad ACECs would not occur as these ACECs contain only BLM-administered lands.

Water Resources: The groundwater-based NSO restriction on floodplains would not be directly applied to locatable minerals since locatable minerals are not leased. However, it would be used as a guide regarding the acceptability of a Plan of Operations within the 30,487 surface acres and 146,169 mineral acres in floodplains, wetlands, riparian areas, and water bodies.

Paleontological Resources: The BLM would strive to protect significant paleontological resources using paleontological surveys in formations with high potential for fossils from NOIs or Plans of Operations surface-disturbing activities. Project denial would not be a viable option unless it would be demonstrated that unnecessary and undue degradation would occur. Excavation would be used to mitigate some impacts where necessary that would result in additional delay and expense to the operator or claimant. This would affect larger sized areas of public surface.

Wildlife: Management of wildlife resources and habitat outside special designations would seldom prevent locatable minerals development, but to avoid significant impact to wildlife, special conditions and possible relocation of exploration or mining development could occur. This relocation, as well as any additional mitigation, would create time delays and further expenses for locatable minerals development. Certain areas for special management of wildlife resources and habitat have been identified as areas within two miles of a sharp-tailed grouse or greater prairie-chicken lek where development would be limited.

Special Designations: The designation of a sage-grouse PPA ACEC along with a withdrawal of minerals in these areas would force mineral development to move to areas adjacent to private lands with private minerals and non-federal lands and also onto BLM administered lands adjacent to the PPA ACEC. Areas already claimed would still be developed, but some infrastructure placement would occur on adjacent lands or private surface/minerals or on non-federal lands instead of on BLM-administered lands within the PPA ACEC.

Impacts under Alternative D (Preferred Alternative)

Withdrawn from Mineral Entry: The area withdrawn from mineral entry would be 7,304 acres comprised of the Fort Meade ACEC and Fossil Cycad ACEC, and including withdrawal of federal minerals (of 410 acres) beneath Bear Butte National Historic Landmark.

Water Resources: The groundwater-based NSO restriction on floodplains would not apply to locatable minerals because they are not leased. However, it would be used as a guide regarding the acceptability of a Plan of Operations within the 30,487 surface acres and 146,169 mineral acres in floodplains, wetlands, riparian areas, and water bodies.

Recreation (Gold Panning): Impacts would be the same as Alternative B.

Paleontological Resources: The BLM would strive to protect significant paleontological resources using paleontological surveys in formations with high potential for fossils from NOIs or Plans of Operations surface-disturbing activities. Project denial would not be a viable option unless it would be demonstrated that unnecessary and undue degradation would occur. Excavation would be used to mitigate some of the impacts where necessary, which would result in additional delay and expense to the operator or claimant. This would affect larger sized areas of public surface.

Wildlife: Management of wildlife resources and habitat outside of special designations would seldom prevent locatable minerals development, but in order to avoid significant impact to wildlife, special conditions and possible relocation of exploration or mining development could occur. This relocation, as well as any additional mitigation, would create time delays and further expenses for locatable minerals development if not closing the area to mineral entry through withdrawal. Certain areas for the special management of wildlife resources and habitat have been identified as areas within two miles of a sharp-tailed grouse or greater prairie-chicken lek where development would be limited.

Cumulative Impacts Common to All Alternatives

The maximum amount of surface acres that are involved in some way in mining operations at any one time would not exceed 100 acres. The maximum amount of land that is not reclaimed to seeding stage would not exceed 100 acres at any given time. Of this, three-fourths is likely to be on federal minerals and the subset that is likely to be BLM-managed public surface is only one-sixth. BLM surface expected to be disturbed by in situ mining of uranium is 14.2 acres. BLM surface expected to be disturbed by gold mining expansion is less than five acres, all from existing mines.

Salable Minerals

Assumptions

Areas would be open to salable mineral extraction proposals. Salable mineral demand is generally met by private sources. There would be a few requests for sand, gravel, and landscaping rock sales.

An estimated six gravel sale proposals would be made over the next 20 years, with three approved and three dropped due to stipulated reclamation and other requirements. This would include BMPs and longer timeframes involved, which may not be acceptable to applicants accustomed to the timeframes of sale-ready commercial operations.

A moss rock/landscaping rock (quartzite) sale proposal may be made at some point during the life of the RMP. The BLM's discretionary sale approval policy could result in declining the request for the sale of materials from areas with other high resource values.

Impacts Common to All Alternatives

Reclamation: Extraction of salable material by excavation or mining would result in a mine or quarried pit. Effects from access roads and pit construction would be minor or moderate depending on the scale of the quarrying operations (size and ability to reclaim the pit and roads). Topsoil saved during operations and respread during reclamation efforts would slightly increase costs, as well as minimize impacts from mining

Stipulated requirements and BMPs designed to avoid or minimize adverse effects would result in additional expenditures.

Cultural and Paleontological Resources: Consultation on TCPs would delay and, in some cases, discourage or even prevent development. Cultural and paleontological surveys would provide moderate costs and delays to those who propose salable mineral operations.

Efforts to camouflage mineral operations to reduce visual resource effects would be necessary.

Leasable and Locatable Minerals: Leasable or locatable mineral operations, as well as renewable energy operations, could interfere with salable mineral operations and cause some added expense and negotiations to find solutions.

Impacts under Alternative A (Current Management)

Withdrawn from Mineral Entry: The area withdrawn from mineral entry would be 6,894 acres comprised of the Fort Meade and Fossil Cycad ACECs.

Paleontological Resources: The BLM would strive to protect significant paleontological resources using paleontological surveys in formations with high potential for fossils from surface-disturbing activities. Project denial would be a viable option. Excavation would be used to mitigate some of the impacts where necessary, which would result in minor additional delay and expense to the operator or claimant. This would affect only small areas of public surface.

Wildlife: The wildlife-based NSO restriction that would limit use within 1/4 mile of piping plover habitat and interior least tern habitat would have minor adverse effects on salable minerals.

Impacts under Alternative B

Withdrawn from Mineral Entry: Impacts from withdrawal of ACEC areas would be the same as in Alternative A. In addition, the federal minerals beneath Bear Butte National Historic Landmark (410 acres) and the Black Hills Army Depot would be closed (12,709 acres). There would be slight impacts from a salable mineral withdrawal as there is little interest or potential in the extraction of salable minerals in these areas.

Paleontological Resources: The BLM would strive to protect significant paleontological resources using paleontological surveys in formations with high potential for fossils from surface-disturbing activities. Project denial would be a viable option. Excavation would be used to mitigate some of the impacts where necessary, which would result in minor delay and expense to the operator or claimant. This would affect only moderately sized areas of public surface.

Wildlife: The wildlife-based NSO restriction limiting use within 1/4 mile for other sensitive raptors would have minor adverse effects on salable minerals.

The wildlife based NSO restriction that would limit use within 1/4 mile of piping plover habitat and interior least tern habitat would have minor adverse effects on salable minerals.

The wildlife based restriction of surface disturbance to no more than five percent within two miles of a sharp-tailed grouse or greater prairie-chicken lek would have minor adverse effects on salable minerals.

Impacts under Alternative C

Withdrawn from Mineral Entry: The area withdrawn from mineral entry would be 7,310 acres comprised of the Fort Meade ACEC, Fossil Cycad ACEC, and federal minerals beneath Bear Butte (410-acres). In addition, salable minerals would be closed in Greater Sage-Grouse PPAs (93,266 acres of BLM-administered surface and 289,563 acres of federal minerals) and beneath Black Hills Army Depot (12,709 federal mineral acres). There would be slight impacts from a salable mineral withdrawal as there is little interest or potential in the extraction of salable minerals in these areas. In the Fort Meade ACEC some small-scale sand or gravel mineral extraction may be foregone but such impact would be very limited.

Paleontological Resources: The BLM would strive to protect significant paleontological resources using paleontological surveys in formations with high potential for fossils from surface-disturbing activities. Project denial would be a viable option. Excavation would be used to mitigate some impacts where necessary, resulting in minor additional delay and expense to the operator or claimant. This would affect larger sized areas of public surface.

Water Resources: The groundwater-based NSO restriction on floodplains would restrict 14,191 surface acres and 72,080 mineral acres in floodplains and riparian areas from extraction of salable minerals.

Wildlife: Impacts would be the same as Alternative B.

Impacts under Alternative D (Preferred Alternative)

Withdrawn from Mineral Entry: Impacts would be the same as Alternative B.

Paleontological Resources: Impacts would be the same as Alternative B.

Water Resources: Impacts would be the same as Alternative B.

Wildlife: Impacts would be the same as Alternative B.

Cumulative Impacts Common to All Alternatives

Minor adverse effects to salable minerals would occur. The greatest opportunity for conflicts would be in floodplains and riparian areas where salable minerals such as sand and gravel tend to be concentrated. Cumulatively, impacts to other resources would likely be minor.

Renewable Energy (Wind and Solar)

Assumptions

Demand for renewable energy development on BLM-administered lands within the planning area (particularly for wind resources) would increase provided that both the technology and economic climate for these uses improve and transmission capacity exists to facilitate power purchase agreements. As energy costs increase, the potential for generation facilities, where alternative energy sources supplement traditional sources, would likely increase. For additional information on wind, see the “Wind Potential” section at the beginning of Chapter 4 on reasonable foreseeable actions and development.

Any renewable energy (wind or solar) developments proposed for the SDFO-managed public lands would result in requests for ROWs that would be considered at the project level with appropriate stipulations applied to protect resource values. Steep slopes, sensitive soils, Greater Sage-Grouse PPAs, recreation management areas, visual concerns, timbered areas, and other issues would influence proposed site selection for renewable energy projects.

ROWs would not be approved in designated ROW exclusion areas; ROWs could be approved in designated ROW avoidance areas, but only if special stipulations would adequately address resource issues.

Specific locations of wind energy development are not projected, except that development could occur on public lands west of the Missouri River (West River). Refer to Map 2-19 for BLM lands by wind power classes/potential.

The analysis is based on professional expertise of the BLM specialists at the SDFO and the Montana/Dakotas State Office, and the realty specialist’s knowledge of the area. Effects are quantified where possible, and in the absence of quantitative data best professional judgment was used.

The SDFO has not received interest or applications for solar and biomass production facilities. Attempts to predict acreage disturbed or the size of facilities for this type of energy development were deemed remote and speculative, and an RFD was not developed.

The majority of renewable energy development is expected to be wind energy development.

The projections of development including the megawatts expected to be produced are displayed to provide a relative comparison between alternatives based on the BLM surface estate available for development in the high to moderate wind potential classes. Other factors may limit development including site lack of high capacity transmission lines and specific resource concerns in proposed development areas. These factors may result in substantial differences between estimated development and actual development figures.

Cost of development and production would increase if infrastructure is required to be sited outside of renewable energy ROW exclusion or avoidance areas.

Impacts Common to all Alternatives

Management actions and BMPs to protect air, soils, water quality, vegetation (including hardwood draws, special status plant species, riparian areas, and wetlands), wildlife, fish and aquatic habitat (including special status wildlife species habitat as well as habitat for certain other species of fish and wildlife), cultural and paleontological resources, visual resources, SRMAs, and special designation areas would affect the BLM's ability to issue renewable energy ROWs on BLM-administered lands. Effects from facilities and actions authorized by renewable energy ROWs would have to be mitigated by applying stipulations, locating in acceptable alternative locations, or in more extreme cases, denying the project altogether. Applicants would encounter time delays and increased costs for project development as a result of these mitigations and as a result of required inventories of various resources.

Applicants would also encounter time delays and greater costs if management of leasable, salable, and locatable minerals and/or recreation is in conflict with the proposed development and requires mitigation or possible relocation.

Stipulations applied to renewable energy facilities in order to meet objectives of the particular VRM class or classes in which a project is proposed would result in additional time and costs in project development. In general, projects located in VRM Class IV areas could proceed as designed unless other issues required mitigation. In instances where relocation or elimination of certain facilities are necessary due to siting in VRM Class II areas, or to a lesser degree VRM Class III areas, such requirements might result in a project proposal being abandoned.

Fire and fuels management and prescribed fire treatments would generally help protect renewable energy facilities authorized on public lands by reducing fuel loads and suppressing fires (213 treatment acres/year in Alternative A; 500 treatment acres/year in Alternatives B, C, and D). Bond requirements would result in assurances that any accidental hazardous materials occurrence would be cleaned up and taken care of properly.

The extent of opportunities for renewable energy generation from public lands would be relative to the amount of acreage available for renewable energy development in each alternative and the types of stipulations prescribed. Denying applications and/or excluding lands from wind energy testing and development would reduce opportunities to utilize renewable energy sources and to increase renewable energy generation from public land. When allowed, approval of renewable energy ROWs would facilitate a diverse energy future by providing sites for environmentally sound development of renewable energy on public lands and lessening dependence on foreign sources of oil. Table 4-78 provides a summary of the total acres of BLM-administered surface in western South Dakota by wind potential class.

The acres available for renewable energy rights-of-way in open, avoidance, and exclusion areas are summarized by alternative in Table 4-79.

Table 4-78
Renewable Energy Rights-of-Way
BLM-Administered Surface Acres in Western South Dakota by Wind Potential Class

Wind Potential Class	*Total Acres Present in Western South Dakota*
Class 1	4,502
Class 2	18,728
Class 3	39,910
Class 4	126,553
Class 5	82,127
Class 6	556
Class 7	941
Total Classified Acres	273,317

Table 4-79
Renewable Energy Rights-of-Way
Open, Avoidance, and Exclusion Areas on BLM-Administered Surface by Alternative (Acres*)

	Alternative A (Current Management)	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Open Areas[1]				
Low to moderate potential (Classes 1-3)	59,135	16,770	15,224	16,667
High potential (Classes 4-7)	208,660	67,394	58,672	59,109
Total for All Classes	267,795	84,164	73,896	75,777
Avoidance Areas[1]				
Low/moderate potential (Classes 1-3)	0	46,371	0	30,550
High potential (Classes 4-7)	0	142,782	0	48,087
Total for All Classes	0	189,153	0	78,636
Exclusion Areas[1]				
Low/moderate potential (Classes 1-3)	4,005	0	47,917	15,923
High potential (Classes 4-7)	1,517	0	151,504	102,979
Total for All Classes	5,522	0	199,420	118,904

[*] Acres listed in the table above and in the following analysis do not include BLM-administered surface estate in eastern South Dakota, as those lands are extremely limited (less than 1 percent of the planning area) and most surface estate in eastern South Dakota is under the reservoirs of the Missouri River or on islands of the Missouri River.

[1] Acres within this table are cumulative, taking out the overlap between resource uses. The most restrictive acres are reported for each acre of ground. Areas of exclusion override and are more restrictive than areas of avoidance and open. Areas of avoidance are more restrictive than open areas.

Refer to Maps 2-20 through 2-23 to view renewable energy ROW restrictions by alternative.

Impacts under Alternative A (Current Management)

Compared to Alternatives B, C and D, Alternative A would provide the most opportunities for renewable energy development. In Alternative A, one percent of the planning area would be closed to development, resulting in loss of the potential to develop 5,522 acres of high potential wind resources. The remaining 267,795 acres would be open to development though subject to site-specific restrictions, timing requirements, or special design features that could ultimately result in increased costs to project proponents and increased processing times.

Wind energy development under Alternative A is estimated to affect 7,423 acres, with 231 acres of long-term disturbance. The projected estimate of energy output would be 593 megawatts of wind power from public lands under this alternative, the greatest amount of wind energy produced of all the alternatives.

In Alternative A, renewable energy ROWs for wind and solar projects would not be excluded on any acreage unless determined on a site-specific basis for BLM-administered surface within the planning area. Appendix R provides a summary of renewable energy ROW restrictions by alternative.

Site-specific restrictions would result in ROWs for wind and solar projects being prohibited on subject lands or constructing ROWs at certain times. Oil and gas stipulations may be applied as needed when such stipulations are applicable to specific renewable energy project proposals (Appendix E). In some cases, applications would be denied if appropriate and adequate mitigation could not be provided.

Site-specific restrictions and/or timing requirements often result in an increase in the cost and time for proposed projects. Alternative A does not provide renewable energy ROW avoidance or exclusion areas; however, the current protection of resources such as sage-grouse, special status raptors, riparian areas, and ACECs may result in some limitations in open areas.

Renewable energy ROW facilities would need to meet objectives for the particular VRM class in which a project was proposed. This would include mitigation (such as applying stipulations), relocation, or elimination of certain facilities resulting in additional time and costs for project development. ROWs for wind and solar projects would be excluded on the 1,231 acres of VRM Class II lands; ROWs on the 4,993 acres of VRM Class III lands would be subject to less restrictive mitigation measures. ROWs on the 531 acres of VRM Class IV lands would normally be allowed unless otherwise restricted. VRM restrictions would result in a reduction of lands available for wind and solar projects by 6,224 acres, which is approximately 2.3 percent of the BLM-administered surface.

Site-specific analysis would require renewable energy ROWs for wind and solar projects to have a special design that would result in an increase in cost and time for proposed projects and reduce opportunities for ROWs for proposed projects through the Lands and Realty program. In some cases it would result in a proposed project being denied.

Allowing prescribed fire on 213 acres of the Fort Meade ACEC each year would result in a negligible adverse effect to renewable energy ROW facilities for wind and solar projects on BLM-administered surface being protected by reducing fuel loads and suppressing fires. This management action would affect approximately 0.07 percent of BLM-administered surface. (Renewable energy ROW exclusion, avoidance, and special feature requirement acreage were determined by GIS to allow for overlap of various resource management actions. In some cases special feature requirements result in areas being avoided or excluded.)

Impacts under Alternative B

Alternative B would result in 189,153 acres of ROW avoidance areas, of which 142,782 acres would be in the high wind potential areas (classes 4-7). There would be no ROW exclusion areas except when sensitive resources are determined to exist in specific proposed project areas. Appendix R provides a summary of renewable energy ROW restrictions by alternative.

The remaining 84,164 acres of BLM surface estate would be open to renewable energy applications would be subject to a variety of standard resource stipulations and BMPs, as well as some specific management actions such as requiring developers to complete multi-year pre-construction studies would result in an increase in cost and time for proposed projects. In the long term, pre-construction studies would give a more complete evaluation of wildlife and habitats that may be affected in the development area and allow for a more complete assessment.

Renewable energy ROW avoidance areas would limit ROWs associated with renewable energy but would not completely exclude renewable energy ROWs in all cases. When there is no practical alternative site for development and impacts are determined to be minor, the BLM could allow a ROW in an avoidance area on a case-by-case basis through project level environmental review. Oil and gas stipulations may be applied as needed when such stipulations are applicable to individual projects (oil and gas stipulations can be found in Appendix E). On a project level basis, NSO, CSU, or Timing Limitation stipulations could be enforced if needed to protect resources. Enforcement of stipulations may result in an increase in the time and potential cost for proposed projects or result in project denials if adequate mitigation cannot be provided. Dependent on the timing restrictions, other mitigations, or special design features such as cut in/cut out speeds, reducing the number or size of turbines, etc., production potential could be reduced to a degree that makes the project uneconomical, and thus reduce the opportunities for generation of renewable energy from BLM-administered public land in the South Dakota Field Office.

In Alternative B, an estimated 192 acres of long-term disturbance would occur with a projected energy output of 493 megawatts of wind power from BLM-administered public lands.

In Alternative B, the requirement for potential renewable energy developers to complete multi-year pre-construction studies would result in an increase in cost and time for proposed projects and reduce opportunities for ROWs. In the long term, pre-construction studies would give a more complete evaluation of wildlife and habitats that may be affected in the development area and allow for a more complete assessment.

In this alternative, ACECs, SRMAs, PPAs, sage-grouse leks, big game winter range, and sagebrush habitat (sagebrush canopy cover over 10 percent) would be avoidance areas for renewable energy development and renewable energy/solar project ROWs. Areas within 1/2 mile of SRMAs and ACECs would be excluded for renewable energy ROWS. Additionally, excluding paleontological localities or cultural site boundaries would result in prohibition from receiving ROWs for wind and solar projects near localities/sites that would potentially result in an increase in cost and time for proposed projects and reduced opportunities for the public to receive ROWs.

Alternative B would require power lines to be buried, eliminated, or designed in a manner to avoid impact to sage-grouse within one mile of sage-grouse leks and in sage-grouse winter range. This requirement would result in an increase in the time and cost of such projects for applicants and possibly cause conflicts if the rest of the power lines on adjoining lands were to be overhead lines. In some cases, proposed ROWs associated with wind and solar projects would be denied. Burial of power lines would result in an increase in the amount of surface disturbance involved in a proposed project compared to overhead power lines.

Requiring renewable energy ROWs for wind and solar projects to have special design and/or timing features would result in an increase in the cost and time for proposed projects and reduce the opportunities for the public to receive wind and solar ROWs on these lands for proposed projects through the lands and realty program.

Renewable energy ROW facilities would need to meet objectives for the particular VRM class where a project is proposed. This would include mitigation (such as applying stipulations), relocation, or elimination of certain facilities resulting in additional time and costs in project development. ROWs for wind and solar projects would be excluded on the 1,544 acres of VRM Class II lands or, if allowed, would have the most restrictive mitigation measures applied to the ROWs. On 5,284 acres of VRM Class III lands, ROWs would be subject to less restrictive mitigation measures, and ROWs on 264,924 acres of VRM Class IV lands would normally be allowed unless otherwise restricted. VRM restrictions would result in reduction of lands possibly available for wind and solar projects by 6,828 acres, which is approximately 2.5 percent of BLM-administered surface.

Prescribed fire would be allowed on 500 acres per year of BLM-administered surface in the planning area. The prescribed fire treatments would result in renewable energy ROW facilities being better protected by reducing fuel loads and suppressing fires.

Impacts under Alternative C

Alternative C would result in 199,420 acres of ROW exclusion areas. Of these acres, 151,504 acres would be in high wind energy potential areas. Appendix R provides a summary of renewable energy ROW restrictions by alternative.

The remaining 73,896 acres of BLM surface estate would be open to renewable energy applications and would be subject to a variety of standard resource stipulations and BMPs, as well as some specific management actions such as requiring developers to complete multi-year pre-construction studies, which would result in an increase in cost and time for proposed projects. In the long term, pre-construction studies would give a more complete evaluation of wildlife and habitats that may be affected in the development area and allow for a more complete assessment.

Renewable energy ROW exclusion areas would prohibit ROWs associated with renewable energy. In contrast, renewable energy ROW avoidance areas would limit ROWs associated with renewable energy but would not completely exclude renewable energy ROWs in all cases. When there is no practical alternative site for development and impacts are determined to be minor, the BLM could allow a ROW in an avoidance area on a case-by-case basis through project level environmental review.

Oil and gas stipulations may be applied as needed when such stipulations are applicable to individual projects (oil and gas stipulations can be found in Appendix E). On a project level basis, NSO, CSU or Timing Limitation stipulations could be enforced if needed to protect resources. Enforcement of stipulations may result in an increase in the time and potential cost for proposed projects or result in project denials if adequate mitigation cannot be provided. Dependent on the timing restrictions, other mitigations, or special design features such as cut in/cut out speeds, reducing the number or size of turbines, etc., production potential could be reduced to a degree that makes the project uneconomical, and thus reduce the opportunities for generation of renewable energy from BLM-administered public land in the South Dakota Field Office.

In Alternative C, an estimated 78 acres of long-term disturbance would occur and the projected energy output of wind energy would be 199 megawatts of wind power from BLM-administered public lands.

In Alternative C, the requirement for potential renewable energy developers to complete multi-year pre-construction studies would result in an increase in the cost and time for proposed projects and reduce the opportunity for ROWs. In the long term, pre-construction studies would include a more complete evaluation of wildlife and habitats that may be affected in the development area and would allow for a more complete assessment and project design to mitigate wildlife issues.

In this alternative, ACECs, SRMAs, PPAs, sage-grouse leks, big game winter range, and sagebrush habitat (sagebrush cover over 10 percent) would be excluded from renewable energy development and renewable energy/ solar project ROWs.

As in the other alternatives, renewable energy ROW facilities would need to meet objectives for the particular VRM class where a project is proposed. ROWs for wind and solar projects would be excluded on the 11,657 acres of VRM Class II lands. ROWs on the 179,212 acres of VRM Class III lands would be subject to less restrictive mitigation measures, and ROWs on the 80,883 acres of VRM Class IV lands would normally be allowed unless otherwise restricted. VRM restrictions would result in reduction of lands available for wind and solar projects by 190,869 acres, which is approximately 69.5 percent of the BLM-administered surface.

Alternative C would require power lines to be buried, eliminated, or designed in a manner to avoid impact to sage-grouse within one mile of sage-grouse leks and in sage-grouse winter range. This requirement would result in an increase in the time and cost of such projects for applicants and possibly cause conflicts if the rest of the power lines on adjoining lands were to be overhead lines. In some cases, proposed ROWs associated with wind and solar projects would be denied. Burial of power lines would result in an increase in the amount of surface disturbance involved in a proposed project compared to overhead power lines.

Prescribed fire would be allowed on 1,000 acres of BLM-administered surface in the planning area. Prescribed fire treatments would result in renewable energy ROW facilities being protected by reducing fuel loads and suppressing fires.

Impacts under Alternative D (Preferred Alternative)

Alternative D would result in 118,904 acres of renewable energy ROW exclusion areas and 78,636 acres of renewable energy ROW avoidance areas. Of the 118,904 acres excluded, 102,979 acres would be in high wind energy potential areas. Of the 78,636 acres in the avoidance areas, 48,087 acres would be in the high wind potential areas. Appendix R provides a summary of renewable energy ROW restrictions by alternative.

The remaining 75,777 acres of BLM surface estate in western South Dakota would be open to renewable energy applications and would be subject to a variety of standard resource stipulations and BMPs, as well as some specific management actions such as requiring developers to complete multi-year pre-construction studies, which would result in an increase in cost and time for proposed projects. In the long term, pre-construction studies would give a more complete evaluation of wildlife and habitats that may be affected in the development area and allow for a more complete assessment.

Allowing renewable energy development on VRM Class II lands (1,544 acres) with mitigation measures rather than excluding all Class II lands would provide greater flexibility to developers, although adequate design may be costly.

In Alternative D, the requirement for potential renewable energy developers to complete multi-year pre-construction studies would result in an increase in the cost and time for proposed projects and reduce the opportunity for ROWs. In the long term, pre-construction studies would require a more complete evaluation of wildlife and habitats that may be affected in the development area and allow for a more complete assessment. Appendix R provides a summary of renewable energy ROW restrictions by alternative.

In Alternative D, an estimated 130 acres of long-term disturbance would occur and the projected energy output of wind energy from BLM-administered lands would be 331 megawatts of power.

In this alternative, ACECs, SRMAs, PPAs, GHAs, and sage-grouse leks would be excluded from renewable energy development and renewable energy/solar project ROWs.

Additionally, excluding paleontological localities or cultural site boundaries would result in prohibition of ROWs for wind and solar projects near the localities/sites. It could also potentially result in an increase in the cost and time for proposed projects and reduce the opportunity for ROWs.

Alternatives C and D would require power lines to be buried, eliminated, or designed in a manner to avoid impact to sage-grouse within two miles of sage-grouse leks and in sage-grouse winter range. The requirement to bury power lines that cannot be sited or designed in a manner that maintains habitat functionality would result in an increase in the cost and time for proposed projects and reduce the opportunity for the public to receive such ROWs. This requirement would possibly cause conflicts if the rest of the power lines on adjoining lands were to be overhead lines. In some cases, proposed ROWs associated with wind and solar projects would be denied. Burial of power lines would result in an increase in the amount of surface disturbance involved in a proposed project compared to overhead power lines.

Requiring renewable energy ROWs for wind and solar projects to have a special design and/or timing features would result in an increase in the cost and time for proposed projects and reduce opportunities for the public to receive wind and solar ROWs for proposed projects through the Lands and Realty program.

Renewable energy ROW facilities would need to meet objectives for the particular VRM class in which a project was proposed. This would include mitigation (such as applying stipulations), relocation, or elimination of certain facilities resulting in additional time and costs for project development. ROWs for wind and solar projects may be excluded on the 1,544 acres of VRM Class II lands. ROWs on the 5,284 acres of VRM Class III lands would be subject to less restrictive mitigation measures, and ROWs on the 264,924 acres of VRM Class IV lands would normally be allowed unless otherwise restricted. VRM restrictions would result in the reduction of the lands possibly available for wind and solar projects by 6,828 acres, which is approximately 2.5 percent of the BLM-administered surface.

Prescribed fire would be allowed on 500 acres per year of BLM-administered surface in the planning area. Prescribed fire treatments would result in renewable energy ROW facilities being better protected by reducing fuel loads and suppressing fires.

Cumulative Impacts

The cumulative impact area is limited to lands within western South Dakota.

Cumulative Impacts under Alternative A (Current Management)

Under Alternative A, few constraints would be placed on renewable energy development. In the planning area 5,522 acres would be ROW exclusion areas for renewable energy development and no areas would be ROW avoidance areas for renewable energy development. Areas that are excluded from ROWs associated with renewable energy would be mostly in the low to moderate wind potential areas (4,005 acres in wind potential Classes 1-3). Under Alternative A, renewable energy development would allow renewable energy developers numerous options for developing areas. BLM actions would not have a substantial effect on renewable energy development in eastern South Dakota because of the limited BLM-administered surface estate present.

If the wind energy development production is developed based strictly on the availability of high wind production potential, this alternative could result in a wind energy megawatt production from BLM-administered lands being reduced to 593 megawatts (compared to the 770 megawatts in the unconstrained development projection).

Cumulative impacts to wind energy development on BLM-administered lands in western South Dakota would be negligible under Alternative A. BLM actions would not have a substantial effect on renewable energy development in eastern South Dakota because of the limited BLM-administered surface estate present.

Cumulative Impacts under Alternative B

Under Alternative B, a moderate level of restriction would be placed on renewable energy development. While there would be no ROW exclusion areas for renewable energy, approximately 189,153 acres (69 percent of the BLM surface estate) would be a ROW avoidance area. Of the 189,153 acres with ROW avoidance restrictions, 142,782 acres (53 percent) of BLM-administered surface estate would be avoided in the high wind potential areas (Classes 4-7).

Renewable energy ROW avoidance areas would limit ROWs associated with renewable energy but would not completely exclude renewable energy ROWs in all cases. When there is no practical alternative site for development and impacts are determined to be minor, the BLM could allow a ROW in an avoidance area on a case-by-case basis through project level environmental review.

If the wind energy development production is developed based strictly on the availability of high wind production potential, this alternative could result in a wind energy megawatt production from BLM-administered lands being reduced to 493 megawatts (compared to the 770 megawatts in the unconstrained development projection). The estimated projection of megawatts produced may vary from actual production as some avoidance areas could be developed pending environmental review.

In the context of wind energy development on all lands in western South Dakota, the cumulative impacts as a result of implementing Alternative B on BLM-administered surface estate would not likely result in a major reduction of renewable energy production because the widespread pattern of moderate to high wind potential as shown in Figure 4-2 allows for opportunity to move a proposed development from a restricted area to other areas. BLM-administered surface estate is limited and in a scattered distribution (with the exception of Butte County) in western South Dakota. This scattered land tenure pattern allows developers some options to move development to other lands. BLM actions would not have a substantial effect on renewable energy development in eastern South Dakota because of the limited BLM-administered surface estate present.

Cumulative Impacts under Alternative C

Alternative C would result in the highest level of restrictions on renewable energy development. Renewable energy ROW exclusion areas would include 199,420 acres (73 percent) of the BLM-administered surface estate in western South Dakota. Of the 199,420 acres excluded, 151,504 acres (56 percent) of BLM-administered surface estate would be in the high wind potential areas (Classes 4-7).

Alternative C would limit development options more than the other alternatives, resulting in an overall reduction in development potential on BLM-administered lands. In many cases, the cost of development and production would increase as infrastructure is sited outside of renewable energy ROW avoidance areas.

If the wind energy development production is developed based strictly on the availability of high wind production potential, this alternative could result in a wind energy megawatt production from BLM administered lands being reduced to 199 megawatts (compared to the 770 megawatts in the unconstrained development projection). The estimated projection of megawatts produced may vary from actual production as some avoidance areas could be developed pending environmental review.

In the context of wind energy development on all lands in western South Dakota, the cumulative impacts as a result of implementing alternative C on BLM-administered surface estate would not likely result in a major reduction of renewable energy production because the widespread pattern of moderate to high wind potential as shown in Figure 4-2 allows for opportunities to move a proposed development from a restricted area to other areas. In addition, BLM-administered surface estate is limited and in a scattered distribution (with the exception of Butte County) in western South Dakota which allows developers some options to move development to other lands. BLM actions would not have a substantial effect on renewable energy development in eastern South Dakota because of the limited BLM-administered surface estate present.

Cumulative Impacts under Alternative D (Preferred Alternative)

Alternative D would result in 118,904 acres of renewable energy ROW exclusion areas and 78,636 acres of renewable energy ROW avoidance areas. Of the 118,904 acres excluded, 102,979 acres would be in high wind energy potential areas. Of the 78,636 acres in the avoidance areas, 48,087 acres would be in the high wind potential areas. Appendix R provides a summary of renewable energy ROW restrictions by alternative. The remaining 75,777 acres of BLM surface estate would be open to renewable energy applications and would be subject to a variety of standard resource stipulations and BMPs.

Alternative D would result in slightly more renewable energy development than Alternatives B or C. Approximately 49 percent of BLM-administered lands would be excluded and 15 percent of these lands would be avoided.

If the wind energy development production is developed based strictly on the availability of high wind production potential, this alternative could result in a wind energy megawatt production from BLM-administered lands being reduced to 331 megawatts (compared to the 770 megawatts in the unconstrained development projection). The estimated projection of megawatts produced may vary from actual production as some avoidance areas could be developed pending environmental review.

In the context of wind energy development on all lands in western South Dakota, the cumulative impacts as a result of implementing Alternative D on BLM-administered surface estate would not likely result in a major reduction of renewable energy production because the widespread pattern of moderate to high wind potential as shown in Figure 4-2 allows for opportunities to move a proposed development from a restricted area to other areas. In addition, BLM-administered surface estate is limited and in a scattered distribution (with the exception of Butte County) in western South Dakota which allows developers some options to move development to other lands. BLM actions would not have a substantial effect on renewable energy development in eastern South Dakota because of the limited BLM-administered surface estate present.

Special Designations

Areas of Critical Environmental Concern (ACECs)

This section describes impacts to the Fort Meade and Fossil Cycad ACECs, designated in the existing plan. 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). The Fort Meade ACEC designation (BLM 2006) identified historic/cultural values as meeting the relevance and importance criteria. The Fossil Cycad ACEC designation (BLM 1999) identified unique paleontology values in meeting the relevance and importance criteria. These identified values (historic/cultural, and paleontology) are the values of concern in these ACECs.

Methods and Assumptions

ACECs are designated to provide special management at Fort Meade and Fossil Cycad for the identified relevant and important values, historic/cultural and paleontology, respectively. The discussion of ACECs focuses on the values of concern and impacts to those values; in addition, other resources and uses are also discussed. The analysis in this section focuses on relative comparisons among alternatives of potential adverse and beneficial impacts in ACECs.

Only one management prescription comes automatically with an 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, a Plan of Operations is required if the area disturbed would be larger than five acres (43 CFR 3809). The requirement for a Plan of Operations allows the BLM some 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. The Fort Meade ACEC is currently withdrawn from locatable mineral development and closed to oil and gas leasing. Salable mineral development is currently not addressed in the Fort Meade ACEC.

To limit adverse impacts to values of concern, specific management prescriptions are adopted for each ACEC. Impacts of ACEC management were determined based on GIS data and information in the RFD Scenario for Oil and Gas, mineral occurrence and development potential assumptions, and wind energy potential development assumptions, as well as other proposed actions for resources and resource uses.

Impacts Common to all Alternatives

Although values of concern vary by area and ACEC, the effects of key management actions (i.e., ROWs, VRM, mineral development, etc.) on these values and other resource uses would have some similarities. The following paragraphs describe the general effects of key management to the Fort Meade and Fossil Cycad ACECs.

All alternatives would maintain the ACEC designation for both the Fossil Cycad and Fort Meade ACEC areas. This designation identifies critical resources to be protected. The SDFO staff has determined that each proposed ACEC meets the FLPMA relevance and importance criteria (BLM 2010c). 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, the analysis in this section is limited to impacts to only those values that meet relevance and importance criteria. Impacts to other values in the ACEC are not analyzed unless they contribute to the need for special management.

Generally, management prescriptions for the protection of air quality, geology, soils and water would benefit ACECs by preventing the degradation of those resources in the ACEC. Where surface-disturbing activities would be permitted within ACECs, they would have the potential to impact ACEC values and would be evaluated on a project level. In almost all surface-disturbing activities, impacts would be avoided by project redesign or relocation negating the need for implementation of mitigation measures. Should adverse impacts be unavoidable, mitigation would be applied prior to allowing a project to proceed. Impacts are analyzed by degree (low to high, or minor to major), by extent (area affected), and whether the impact is beneficial, adverse, or neutral to the resource.

Identification and protection of nationally important cultural sites and features would be continued on the 3,370 acres currently listed on the National Historic Register within the Fort Meade ACEC. This would provide special protective measures to the cultural resources and the impact would be beneficial on these acres

Acquiring lands by purchase, exchange, revocation of another agency's withdrawal, administrative transfer from another agency, cooperative agreement, or donation would benefit ACECs if such actions occurred within or near an ACEC. Additional land would provide a buffer for adjacent activities, and could provide or enhance additional specific value to the ACEC. Land exchange or disposal within or near ACECs away from federal management would have a negative impact because resources and values would no longer be protected by laws and regulations specific to resources on public lands. The extent of the impacts would depend on the amount of the ACEC that is affected by the specific actions.

Impacts from livestock use are caused by forage utilization, trampling, trailing, rubbing, water developments and fences. Impacts can vary according to resource type and environmental setting. Authorizing grazing and range improvements that provide for improvement or maintenance of ecosystem functionality would be allowed as long as grazing and improvements would not damage ACEC values. Trampling, trailing, and rubbing may directly impact resources, while erosion, vegetation, and landscape modification may indirectly impact resources. Grazing preference adjustments would be made on a case-by-case basis. If necessary, modifications would be made or mitigation measures would be applied to reduce impact potential from the preference adjustment. Impacts from properly mitigated grazing would be negligible to minor.

The management action requiring a minimum of 8-12 inches of stubble height (residual grass cover) to be maintained over 50 percent of the Fort Meade ACEC would benefit the values of concern by increasing protection of soils and water quality with more herbaceous plant cover to intercept precipitation runoff and filter sediment. In addition, the stubble height requirement would benefit most wildlife species, especially sharp-tailed grouse and other ground nesting birds. Maintaining higher levels of grass cover would reduce the visibility of small cultural artifacts and may reduce the potential for unauthorized collection of these artifacts within the ACEC. The various alternatives provide slightly different levels of grazing use and acres grazed within the Fort Meade ACEC. These varying use levels would not result in differences in the impact of grazing on ACEC values of concern.

The SRMA designation of Fort Meade would provide for recreational opportunities, but limit the level and intensity of development and surface disturbance. This would minimize impacts and disturbance to wildlife and special status species, and the ACEC values of concern.

Recreation would be managed by requiring SRPs for commercial, competitive, and large group activities. The permitting procedure related to issuing SRPs would include requirements to avoid disturbance to resources of concern within the ACECs and to identify mitigation, as appropriate. Dispersed and developed recreation would be managed to complement cultural resources, including avoidance and interpretation. Based on these management actions, impacts to ACEC values of concern would be negligible.

Under all alternatives, no additional target/shooting ranges would be authorized. The existing muzzleloader range would continue to be authorized. Black powder or archery would be acceptable on this target range. Limiting the expansion of ranges would result in a long-term benefit to ACEC values by eliminating impacts from concentrated use areas and would also protect public health and safety.

Use of firearms for hunting purposes would be prohibited in certain areas at the Fort Meade ACEC under all alternatives (see Chapter 2, Figure 2-2). This management action would not impact values of concern; however, it has a long-term beneficial impact to a safe recreating environment.

Management actions to protect the values of concern associated with both ACECs would protect wildlife habitat by restricting surface-disturbing activities and limiting motorized vehicle use and new road construction. These actions would reduce habitat fragmentation and minimize disturbance to wildlife, as well as actions that allow vegetative treatments to promote and enhance habitat conditions.

Prescribed fire would have the potential to negatively impact ACEC resources and values of concern, resulting from fire line disturbances and from removal or reduction of vegetative material obscuring cultural resources. Cultural resource

surveys would be conducted to identify cultural values prior to fire ignition to identify appropriate application measures, which would result in negligible impacts to cultural resources. Cultural resource surveys would also be conducted post burn, where appropriate, to monitor and identify exposed cultural resources not previously recorded or known prior to the disturbance. This practice would help realize the minor beneficial aspects of prescribed burning to cultural resources.

OHV use would be limited to designated roads and trails within the Fort Meade ACEC, unless specifically authorized, which would reduce potential impacts to negligible. New permanent roads would not be allowed except for minor rerouting of existing roads. OHV use would be limited to designated roads and trails within the Fossil Cycad area. This motorized travel restriction would minimize negative impacts to the paleontological values by preventing direct disturbance to these resources and by limiting access and the potential for indirect impacts from theft and vandalism as the area becomes more accessible to the public.

Within the Fort Meade ACEC, vegetation management in the form of forest product removal has the potential to impact cultural resources through ground disturbance from skidding, road maintenance, and pile burning. Impacts include disturbing or displacing cultural resources and exposing and locating cultural resources. Impacts to the ACEC values of concern would be negligible because of mitigation measures applied at the project level analysis.

Military exercises that are compatible with the objectives of the Fort Meade ACEC management plan would be allowed. These types of exercises, when properly coordinated, would result in minor, adverse short-term impacts to ACEC values of concern; however, long-term impacts to resource values of concern would be avoided or minimized.

Continued withdrawal of all minerals within the Fort Meade ACEC would eliminate surface disturbance resultant from mineral development and would maintain and protect the ACEC values of concern. Surface occupancy and use for oil and gas would be prohibited within and up to 1/2 mile of the ACECs, which would avoid or eliminate impacts from oil and gas exploration and development and protect the resource values of concern within the ACECs.

Fort Meade ACEC

Impacts under Alternative A (Current Management)

Special Designations: The transfer of BLM-administered public land for the proposed Black Hills National Cemetery expansion would be allowed if consistent with the ACEC direction/goals. The transfer would be less likely to be approved compared to Alternative B or D. If the transfer is not approved, up to 170 acres of BLM-administered public land in the ACEC would be maintained. Maintaining the military tradition at Fort Meade would be more difficult if the land is not transferred.

No transfer of public land to the South Dakota National Guard for facilities would result in a larger ACEC. Maintaining the military tradition at Fort Meade would be lessened compared to Alternatives B and D.

Vegetative Communities: Gathering plants and plant parts for incidental use would have a negligible adverse impact on vegetative communities. Incidental use, as defined in the Glossary, indicates that small quantities of plants would be gathered for personal use. Allowing gathering of underground plant parts has the potential to disturb ACEC resources of value, which would be a long-term major adverse impact.

Vegetation treatments would cause short-term disturbance and would result in long-term beneficial impacts to grassland and shrubland communities. Vegetation treatments that successfully achieve 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. Vegetation treatments designed to decrease the presence of or reduce the susceptibility to invasion by invasive plants and pests and noxious weeds would have a beneficial impact on vegetation.

Conversion of non-native vegetation to native vegetation would occur at a smaller scale compared to Alternative C. Less risk of inadvertent damage to cultural resources would occur as fewer acres would be treated.

Invasive Species: Allowing mechanical thinning, biomass removal, chemical, and biological treatments to woody and non-woody vegetation as a means to reduce hazardous fuels would also aid in noxious weed treatment by removing

dense vegetation and improving accessibility to those weed areas requiring treatment. In addition, these management actions would improve stand density and susceptibility of ponderosa pine, reducing the threat from declared pest species such as the Mountain Pine Beetle and Ips Bark Beetle.

Aquatics and Fisheries: Periodic stocking of fish at the Fort Meade and Cottle Creek reservoirs would provide the highest level of fishing opportunities. Impacts would be the same under Alternatives A, B and D.

Cultural: The ACEC designation and protection management would provide adequate protection to high value cultural resources inside the Fort Meade National Register Site boundary (approximately 3,200 acres). The BLM is required to do formal consultation with the State Historic Preservation Office and Advisory Council for projects planned within the 3,200 acres. Major undertakings inside this boundary may require programmatic agreements. Gathering of plants and plant roots would be allowed on a noncommercial basis. This alternative has the potential to cause long-term impacts in localized areas as artifacts may be damaged by the process of digging up plants with a shovel.

Wildlife Habitat: Alternative A would maintain a riparian stubble height (residual vegetation height after grazing) of at least four inches. The lower riparian stubble height requirements would result in less optimal conditions for wildlife species dependent on riparian vegetation compared to Alternative C, which would maintain at least a six-inch stubble height in riparian areas.

Fire Management and Ecology: Opportunities to improve fire regime condition classes at the Fort Meade ACEC would be the lowest in this alternative. Forested acres treated would continue to target developed areas in the wildland urban interface, with small-scale treatment opportunities in undeveloped areas for forest health, rangeland health, and wildlife habitat improvement or protection.

Visual Resources: Retention of existing VRM class designations would provide direction for management of the visual resources on portions of the Fort Meade ACEC. Under Alternatives A, B, and D, fewer acres would have a VRM Class II designation (1,231 acres) compared to Alternative C, which would provide 6,515 acres in VRM Class II (refer to glossary for the definition of VRM Classes).

Under Alternative A, VRM classifications within the Fort Meade ACEC would be as follows:

- Class I: 0 acres
- Class II: 1,231 acres
- Class III: 4,993 acres
- Class IV: 218 acres
- No designation: 291 acres

Livestock Grazing: Limiting livestock grazing on the Fort Meade ACEC from May 15 through October 15 would have a minor impact on ACEC values as more livestock would be present on the allotment, but the change would be offset by a shorter grazing season. The number of livestock would be increased slightly for the shorter grazing season compared to Alternatives B and D to utilize available AUMs on the allotments.

The Fort Meade Allotment would have 2,620 acres and 562 AUMs. The Bear Butte Allotment would have 2,750 acres and 1,261 AUMs. The difference in AUMs in all alternatives would be a result of the loss of land available for grazing if lands are transferred out of BLM management to another party (up to 226 acres). Exclosures would not be grazed. Lack of grazing in these exclosures would not compromise ACEC values.

Recreation: New firearm or archery ranges would be prohibited. Limiting the expansion of shooting ranges would result in a long-term benefit to ACEC values by minimizing concentrated use in the area which could disturb surface resource values.

Travel: Under Alternative A, construction of temporary roads would not be allowed. This would eliminate or minimize impacts to ACEC values of concern. ROWs associated with roads may increase vehicular travel use within the ACEC, depending on the type and location of the ROW. Short-term, adverse impacts from increased motorized travel (e.g., increased dust and erosion concerns) would impact scenic values within the ACEC; however, limiting motorized travel to designated routes would eliminate or minimize surface disturbance and restrict access to resource sensitive areas

within the ACEC. Alternative A would not create ROW exclusion or avoidance areas within the Fort Meade ACEC. ROWs associated with roads may increase travel use within the ACEC depending on the type and location of the ROW. Routes associated with ROWs could result in adverse long-term impacts to the ACEC values of concern.

Lands and Realty: Public lands within the Fort Meade ACEC would not be considered for disposal, except for 5.83 surface acres considered for potential disposal (by sale). While the disposal action would require cultural clearances and site-specific analysis, the potential disposal of BLM public lands within the existing ACEC boundary would result in a slight loss of cultural and historic resource values.

BLM public land transfers, including lands adjacent to the Fort Meade National Cemetery and BLM public land east of the Fort Meade Hospital complex, would not be transferred unless such transfer is consistent with ACEC goals. Approval of a transfer would be less likely compared to Alternatives B and D.

The BLM would not seek opportunities to purchase or transfer of land adjacent to the ACEC. The potential for beneficial impacts to enhance ACEC values through acquisition of additional lands would be less likely.

Alternative A would not create ROW exclusion or avoidance areas within Fort Meade ACEC; however, restrictions would be placed on specific activities. ROWs would have to be compatible with resource objectives and limit disruption within the ACEC. ROWs associated with roads may increase travel use within the ACEC depending on the type and location of the ROW. Impacts would be moderate adverse long-term impacts.

Renewable Energy: Under Alternative A, commercial renewable energy development authorizations could be allowed at the Fort Meade Recreation Area, and would be considered at the specific project scale. This would provide lease protection for the ACEC values, would result in surface disturbance and visual quality conflicts, and would negatively impact ACEC resource values of concern.

Impacts under Alternative B

Special Designations: Transfer of up to 170 acres of BLM-administered public land to the Department of Veterans Affairs for expansion of the Black Hills National Cemetery would reduce the size of the ACEC but would provide for a continuation of the military tradition at Fort Meade.

Transfer of up to 50 acres of public land to the South Dakota National Guard for facilities would reduce the size of the ACEC but would provide for a continuation of the military tradition at Fort Meade.

Vegetative Communities: Conversion of non-native vegetation to native vegetation would occur at a smaller scale compared to Alternative C. Less risk of inadvertent damage to cultural resources would occur as fewer acres would be treated.

Invasive Species: Under Alternative B the Fort Meade ACEC would be designated as a SRMA. This would result in a higher impact potential from noxious weeds than Alternative A, based on more emphasis and intensive recreation management activities, which could result in an increased potential for the introduction and spread of noxious weeds and invasive species.

Aquatics and Fisheries: Impacts would be the same as those described under Alternative A.

Cultural: Alternative B would provide National Landmark Designation for the Fort Meade ACEC. Alternative B would provide the most protection to cultural resources through a national designation, allowing opportunities for cooperative agreements and preservation grants. Change to a Landmark designation would also result in additional protection for 3,370 acres that are outside the present National Register boundary but within the historic Military Reservation boundary for Fort Meade. A Landmark designation would result in more time for consultation for major undertakings compared to Alternatives A and C, as a Landmark designation would require a more thorough intensive review process of proposed projects at the national level.

Alternative B would result in less potential for damage to artifacts as only above-ground gathering of plants would be allowed.

Wildlife Habitat: Alternative B would maintain a riparian stubble height (residual vegetation height after grazing) of at least four inches. The lower riparian stubble height requirements would result in less optimal conditions for wildlife species dependent on riparian vegetation compared to Alternative C, which would maintain at least a six-inch stubble height in riparian areas.

Fire Management and Ecology: This alternative would provide good opportunity to expand mechanical and prescribed fire treatments throughout the Fort Meade ACEC. Acres treated would continue to target developed areas, but would also target more remote areas to improve forest/rangeland health and improve or protect other resources. During the life of the RMP, a fair gain could be made toward restoring landscape forest health, fire regimes, and improving and/or maintaining condition class, as this alternative would provide the most acres treated in the Fort Meade ACEC. Alternatives B and D would provide the highest level of treatments.

Visual Resources: Designation of VRM classes would provide a system for managing visual resources. The Fort Meade ACEC would be completely designated for visual resource management classifications. This alternative would manage a majority of the surface acres in VRM Class III, which would provide adequate protection of scenic quality and viewsheds of the area. The 1/2 mile buffer restricting development around SRMAs would have limited benefit in protecting the visual resources. The BLM does not manage surface acres adjacent to the SRMAs, so energy development would not likely be affected. The buffer would act as a triggering mechanism for comments where comments are sought.

VRM classifications would be as follows

- Class I: 0 acres
- Class II: 1,231 acres
- Class III: 5,284 acres
- Class IV: 218 acres

Livestock Grazing: A longer grazing season would result in cattle present on the ACEC for a longer period; however, this change would also result in cattle on the ACEC for a shorter period. The impact would be negligible.

The Fort Meade Allotment could have 2,520 acres and 540 AUMs. The Bear Butte Allotment would have 2,531 acres and 1,161 AUMs (AUMs and grazing use dates would be the same as Alternative C). Fenced exclosures could be grazed periodically as needed to reduce fuels buildup or for research purposes. Grazing the vegetation in the exclosures would not negatively impact ACEC values.

Recreation: Alternatives B, C, and D would provide a SRMA designation for the Fort Meade ACEC. The SRMA designation would recognize the recreational values of Fort Meade and actively manage for the character of the area, as well as identify funding and coordinated management opportunities for the area.

While snowmobiles are not allowed at the Fort Meade ACEC under any alternative, Alternative B would provide an extra measure of protection during winter periods by limiting vehicles specifically modified or designed to travel across or over the snow (such as modified UTVs and ATVs).

Use of firearms for hunting purposes would be prohibited in certain areas at the Fort Meade ACEC under all alternatives (see Chapter 2, Figure 2-2). Alternatives B, C, and D provides additional direction that prohibits use of air guns and other types of pneumatic devices for shooting.

Travel: Alternative B would not allow construction of temporary roads, which would provide protection for the ACEC values and minimize impacts resulting from increase roads.

Alternative B would designate the entire Fort Meade ACEC as a ROW exclusion area (except for Hooper Dairy Road, and all other valid existing rights and corridors) as described in the Fort Meade ACEC Management Plan of 1996. This action would protect ACEC values by limiting the increase in ROWs and the resultant expansion of travel routes.

Lands and Realty: Up to 170 acres of public land would be considered for transfer to the Department of Veterans Affairs for expansion of the Black Hills National Cemetery. If consideration of such transfer is approved up to 170 acres would be removed from the Fort Meade ACEC provided the transfer is completed.

Up to 50 acres of public land in the Fort Meade ACEC east of the Fort Meade Hospital complex could be transferred to the SD Army National Guard. If the transfer is approved up to 50 acres would be removed from the Fort Meade ACEC. Fort Meade would be designated as a ROW avoidance area except for the ROW utility corridor and the Hooper Dairy Road.

Removal of up to 226 acres of public land for these transfers would have moderate long-term impacts to the ACEC values but would continue the military tradition of Fort Meade.

If other land adjacent to the ACEC becomes available for purchase or transfer, the BLM would consider purchase or transfer if the land increases the ACEC values. This would result in the potential for increased ACEC benefits compared to Alternative A.

This action would protect ACEC values by limiting the increase in ROWs and the resultant surface disturbance and visual presence of structures.

Renewable Energy: No renewable energy development authorizations would be allowed within 1/2 mile of the Fort Meade ACEC. Exceptions would be made for small, noncommercial projects directly related to management of Fort Meade ACEC.

Impacts under Alternative C

Special Designations: No land would be transferred from the ACEC for military purposes. The size of the ACEC would not be decreased. ACEC values would be maintained. Continuation of the military tradition at Fort Meade would be more difficult.

Vegetative Communities: Under Alternative C, conversion of non-native vegetation to native vegetation would be emphasized to a greater degree than in Alternatives A, B, and D. The number of acres of vegetative treatment would be driven by the need to protect cultural resources in the ACEC. The potential for inadvertent damage to cultural resources, resulting from vegetation treatments, would be highest in this alternative as there would be more intense conversion to native grasslands.

Invasive Species: Impacts would be the same as Alternative B.

Aquatics and Fisheries: Under Alternative C, fish would be stocked less frequently as stocking would only occur if natural reproduction is inadequate to maintain populations of fish. This could result in a slight decline in fishing opportunities through a decrease in the number and size of fish.

Cultural: In this alternative, incorporating the additional 3,370 acres of the historic Military Reservation into the National Register Site boundary would provide better protection to cultural resources and more opportunities for cooperative management than in Alternative A, and less than in Alternative B. This change would result in additional time for formal consultation on major undertakings on the additional 3,370 acres as a Landmark designation would require a more thorough intensive review process of proposed projects at the national level.

Increasing the NRHP designation to include all of the historic Fort Meade Military Reservation (6,570 acres) would increase protection on the area, but not as much as the National Landmark Designation that is proposed in Alternative B (refer to Glossary for definitions of National Historic Landmark and National Register of Historic Places definitions). Landmark sites require more oversight, so it is likely cultural resources would be more thoroughly protected. Visitation is less likely to increase from the Historic Place Designation compared to the Landmark Designation because of the higher status of the Landmark Designation. Landmarks are often visitor destinations in themselves.

Alternative C would result in less potential for damage to artifacts compared to Alternative A, as only above-ground gathering of plants would be allowed.

Wildlife Habitat: Alternative C would maintain a riparian stubble height (vegetation height after grazing) of at least six inches (as compared to four inches in Alternatives A, B, and D). Higher riparian stubble height requirements would result in the greatest beneficial impact to wildlife species dependent on riparian vegetation.

Fire Management and Ecology: Alternative C would provide an intermediate degree of vegetation treatments for management of fuels. The amount of land that would be treated in the ACEC would be higher than alternative A but less than Alternatives B and D. Forested acres treated would continue to target developed areas in the wildland urban interface, with small-scale treatment opportunities in undeveloped areas for forest health, rangeland health, and wildlife habitat improvement or protection.

Visual Resources: Designation of VRM classes would provide a system for managing visual resources. The Fort Meade ACEC would be completely designated into VRM classes. This alternative would place the majority of Fort Meade in the VRM Class II and would provide the greatest measure of protection for the visual landscape in the ACEC and preserve the scenic qualities of the area. The one-mile buffer restricting development around SRMAs would have limited benefit in protecting the visual resources. The BLM does not manage surface acres adjacent to the SRMAs, so energy development would not likely be affected. The buffer would act as a triggering mechanism for comments where comments are sought.

VRM classifications would be as follows:

- Class I: 0 acres
- Class II: 6,515 acres
- Class III: 0 acres
- Class IV: 218 acres

Lands and Realty: Lands adjacent to the Black Hills National Cemetery would not be transferred to the Department of Veterans Affairs for expansion of the National Cemetery. All acreage currently in the Fort Meade ACEC would remain part of the ACEC.

Public land east of the Fort Meade Hospital complex would not be transferred to the National Guard. All acreage currently in the Fort Meade ACEC would remain part of the ACEC.

If other land adjacent to the ACEC becomes available for purchase or transfer, the BLM would consider purchase or transfer if it increases the ACEC values. This would result in the potential for increased ACEC benefits compared to Alternative A.

ROW impacts would be the same as Alternative B.

Livestock Grazing: The Fort Meade Allotment would have 2,620 acres and 562 AUMs. The Bear Butte Allotment would have 2,750 acres and 1,261 AUMs. Grazing use dates would be from May 1 to October 31 (AUMs and grazing use dates would be the same as alternative A). Fenced exclosures could be grazed periodically as needed to reduce fuels buildup or for research purposes. Grazing the vegetation in the exclosures would not compromise ACEC values.

Recreation: Impacts would be the same as Alternative B.

Travel: Impacts would be same as Alternative B.

Renewable Energy: No renewable energy development authorizations would be allowed at the Fort Meade Recreation Area or within one mile of the SRMA designation (Fort Meade ACEC). Exceptions could be made for small, noncommercial renewable energy projects directly related to management of the Fort Meade ACEC. This alternative would provide the most protection for ACEC values, as surface disturbance would be avoided or minimized and scenic quality and viewsheds would be protected.

Impacts under Alternative D (Preferred Alternative)

Special Designations: Impacts would be the same as Alternative B.

Vegetative Communities: Conversion of non-native vegetation to native vegetation would occur at a smaller scale compared to Alternative C. Less risk of inadvertent damage to cultural resources would occur as fewer acres would be treated.

Invasive Species: Impacts would be the same as Alternative B.

Aquatics and Fisheries: Impacts would be the same as those described under Alternative A.

Cultural: Alternative D would provide higher levels of protection to cultural resources compared to Alternatives A and B, but would provide slightly less protection compared to Alternative C. Alternative D would provide the same designation as Alternative C but makes such designation dependent on cooperation with other agencies and partners. Alternative D also provides fewer acres in VRM Class II compared to Alternative C.

Alternative D would result in less potential for damage to artifacts compared to Alternative A as only above-ground gathering of plants would be allowed.

Wildlife Habitat: Alternative D would maintain a riparian stubble height (residual vegetation height after grazing) of at least four inches. The lower riparian stubble height requirements would result in less optimal conditions for wildlife species dependent on riparian vegetation compared to Alternative C which would maintain at least a six-inch stubble height in riparian areas.

Fire Management and Ecology: Impacts would be the same as Alternative B.

Visual Resources: Impacts would be the same as Alternative B.

Lands and Realty: Up to 170 acres of public land would be considered for transfer to the Department of Veterans Affairs for expansion of the Black Hills National Cemetery. If such transfer is approved up to 170 acres would be removed from the Fort Meade ACEC.

Up to 50 acres of public land east of the Fort Meade Hospital complex would considered for transfer to the National Guard. If the transfer is approved up to 50 acres would be removed from the Fort Meade ACEC.

Removal of up to 226 acres of public land for these transfers would have moderate long-term impacts to the ACEC values but would continue the military tradition of Fort Meade.

If other land adjacent to the ACEC becomes available for purchase or transfer, the BLM would consider purchase or transfer if the land increases the ACEC values. This would result in the potential for increased ACEC benefits compared to Alternative A.

Livestock Grazing: The Fort Meade Allotment could have 2,520 acres and 540 AUMs. The Bear Butte Allotment (north portion of ACEC) would have 2,531 acres and 1,161 AUMs. Grazing use would be from May 15 to October 31. (AUMs and grazing use dates would be the same as Alternative B). Fenced exclosures could be grazed periodically as needed to reduce fuels buildup or for research purposes. Grazing the vegetation in the exclosures would not compromise ACEC values.

Recreation: Impacts would be the same as Alternative B, except designated camping areas would be same as Alternative A. In addition, Alternative D would provide for the flexibility to consider developing local trails through site-specific analysis. Cultural surveys and inventories would be required at the project scale to determine if impacts to resources would occur. Enhancing the trail systems would provide enhanced visitor experiences and interpretive opportunities for the cultural and historic features of the area.

Travel: Temporary roads could be constructed as needed. These roads would be decommissioned once the intended work identified in the appropriate authorization(s) is completed, and the temporary roads would be rehabilitated once the road is closed. Construction of temporary roads would have a minor short-term impact on the ACEC values as there would be a greater potential to impact cultural resources from the surface disturbance. Creation of temporary roads is expected to be infrequent and would normally be associated with vegetation treatments or other ROWs related to valid existing rights.

Alternatives B, C, and D would designate the entire Fort Meade ACEC as a ROW exclusion area (except for Hooper Dairy Road and all other valid existing rights and corridors) as described in the Fort Meade ACEC Management Plan of 1996. This action would protect ACEC values by limiting the increase in ROWs and the resultant expansion of travel routes.

Renewable Energy: No renewable energy development authorizations would be allowed at the Fort Meade Recreation Area or within 1/2 mile of the SRMA designation (Fort Meade ACEC). Exceptions would be made for small noncommercial projects directly related to management of the Fort Meade ACEC.

Fossil Cycad ACEC

Impacts under Alternative A (Current Management)

The Fossil Cycad ACEC would continue to be designated as an ACEC (320 acres). This designation and management actions would protect the ACEC resource values, and minimize or eliminate surface-disturbing activities. Surface occupancy and use for oil and gas would be prohibited which would protect ACEC values. However, surface use for other resource uses such as commercial wind energy development and ROWs would not be restricted, which would result in surface impacts to critical paleontological resource values. Motorized vehicular travel would be limited to existing roads and trails, which would minimize surface disturbance to existing travel routes; however, the motorized access to the area could result in potential impacts to the ACEC resource values from vandalism and theft. The Fossil Cycad ACEC would continue to have a VRM rating of Class IV, which would not provide adequate protection or restrictions from visual intrusions of the area and would diminish the scenic values of the ACEC.

Under Alternative A, the Fossil Cycad ACEC would be withdrawn from mineral entry.

Impacts under Alternative B

Impacts would be the same as Alternative A, except that oil and gas would be available for lease with NSO stipulations, and the surface use restrictions would also apply to wind energy and ROWs, which would avoid or minimize surface disturbance to the ACEC and protect the paleontological resource values. Under Alternative B, the Fossil Cycad ACEC would have a higher visual class rating, Class II, than under Alternative A. This would protect the visual and scenic qualities of the area and restrict development and visual obtrusions.

Impacts under Alternative C

Impacts would be the same as Alternative B, except oil and gas minerals would be closed within the Fossil Cycad ACEC, and the ACEC would be an exclusion area for renewable energy development.. This management action would provide the greatest amount of protection to the ACEC and would eliminate potential impacts from mining activities.

Impacts under Alternative D (Preferred Alternative)

Alternative D incorporates the management from Alternative C, and would provide the most protective management actions for the ACEC resource values.

Sage-Grouse Protection Priority Areas ACEC

Impacts under Alternative A (Current Management)

No impacts would occur. Under Alternative A, there would be no designation of PPAs and no PPAs ACEC designation.

Impacts under Alternative B

No impacts would occur. Under Alternative B, there would be no PPAs ACEC designation.

Impacts under Alternative C

Additional protection offered by ACEC designation in the Greater Sage-Grouse PPAs would be difficult to implement, and management effectiveness would be limited for the following reasons: 1) The intermingled pattern of land ownership in the PPA (Map 2-5 and ACEC Figure 2-1). 2) Existing management units such as grazing allotments and associated infrastructure (roads, fences, pipelines, powerlines, etc.) currently overlap from adjacent BLM-administered and other lands. 3) Nearly all high potential, locatable mineral ownership that is likely to be mined in the PPAs is already claimed. The BLM would be obligated to honor existing claims so mining of bentonite in these areas could continue regardless of the ACEC designation.

Compared to Alternative A, an ACEC designation would provide some limited benefit to sage-grouse as Alternative A would provide no PPAs and limited protection for sage-grouse, although benefits from an ACEC designation would be limited for the reasons provided in the preceding paragraph.

Compared to Alternatives B and D, the net benefit resulting from an ACEC designation in Greater Sage-Grouse PPAs would be limited as minerals in PPAs would be closed, withdrawn or under NSO restrictions regardless of ACEC designation. In addition, oil and gas leases in the northern portion of the PPAs are mostly held by production. Producers would be able to drill wells and produce oil and gas as their producing leases would be honored as valid, existing rights that were present prior to Record of Decision for this RMP/EIS.

An ACEC designation would provide little practical protection to sage-grouse and other resources other than those measures already provided through other restrictions for the PPAs. Complete or partial fencing of the PPAs and intensive signing of the public land ACEC boundaries would be needed to manage the PPAs as a separate management unit. Such extensive fencing and signage would be cost prohibitive and require high levels of maintenance.

On a large scale, an ACEC designation would break the continuity and scale of widespread dispersed uses across the landscape and when combined with the closure/withdrawal of minerals and the ROW exclusion that Alternative C would provide, an ACEC designation would shift or concentrate many resource uses from BLM-administered lands to public and private lands adjacent to the PPAs ACEC or onto private lands within the ACEC. Given the intermingled nature of land ownership in this area and the management requirements of an ACEC, coordination with users and public groups would be more complicated and management response to changing conditions less timely and flexible under an ACEC designation. Management restrictions of travel would be especially complex as a particular road may enter and exit the PPAs ACEC dozens of times within a few miles (refer to Figure 2-1 and Map 2-5 for a visual representation of the complexity of the land ownership pattern and display of the PPA boundaries). The only practical means to manage travel would be through an inclusion of areas adjacent to PPAs into one travel management area.

Impacts under Alternative D (Preferred Alternative)

No impacts would occur. Under Alternative D there would be no PPAs ACEC designation.

National Back Country Byways

Impacts Common to All Alternatives

The Fort Meade Back Country Byway would continue to be designated across all alternatives. The back country byway designation protects important recreational travel routes. Retaining the byway designation would provide beneficial impacts by increasing opportunities for interpretation and education for the cultural and historical resources of the area. Economic benefits from retaining the back country byway designation would include retaining recreational spending in local areas, increased contributions to local economies, and increased attractiveness of the area.

Adverse impacts to the Fort Meade Back Country Byway would result from management actions that substantially limit or prevent public use. This travel route is frequently used and would be susceptible to impacts over the long term, including the potential for increased soil erosion, road maintenance, fugitive dust, and the potential spread of invasive, nonnative plants. However, specific proposals would be evaluated on a project-level basis (implementation level). In almost all surface-disturbing activities, impacts would be avoided by project redesign or relocation negating the need for the implementation of mitigation measures. Should adverse impacts be unavoidable, mitigation would be applied prior to allowing a project to proceed. Impacts would not be detrimental from any of the alternatives.

National Recreation Trails

Impacts Common to All Alternatives

Where surface-disturbing activities are permitted, activities would have the potential to impact national recreation trail values and would be evaluated on a project basis. In almost all surface-disturbing situations, impacts would be avoided by project redesign or relocation negating the need for implementation of mitigation measures. Should adverse impacts be unavoidable, mitigation would be applied prior to allowing a project to proceed.

Impacts under Alternative A (Current Management)

No impacts would result from implementation of Alternative A.

Impacts under Alternative B

Designation of a SRMA for the Exemption Area would have beneficial impacts to the Mickelson Trail, currently designated as a National Recreation Trail. This would allow for more proactive management for recreational and visitor values to meet the objectives identified in the SRMA, and could result in increased visitation to the area. The impacts from increased visitation would be beneficial in terms of recreation opportunities, but may be considered adverse in terms of user conflicts. For example, bicyclists may have more conflicts with increased numbers of pedestrians. It is anticipated that development of motorized trails in Alternative B would lessen the pressure on the Mickelson Trail for motorized use. Additional trails for non-motorized use would be developed after site-specific analysis.

Impacts under Alternative C

No impacts would result from implementation of Alternative C.

Impacts under Alternative D (Preferred Alternative)

Impacts would be same as Alternative B.

Wilderness

Impacts Common to All Alternatives

A wilderness suitability review was conducted, and there are no recommendations to create Wilderness Areas or Wilderness Study Areas under any of the alternatives. No impacts to Wilderness areas and lands with wilderness characteristics would occur from implementation of any alternative.

Wild and Scenic Rivers

Impacts Common to All Alternatives

A review of the potential for Wild and Scenic River recommendation was conducted, and there are no recommendations for Wild and Scenic Rivers. No impacts to Wild and Scenic Rivers would occur from implementation of any alternative.

Cumulative Impacts

No cumulative impacts to Special Designations would result from implementation of the alternatives.

Support

Facilities

Assumptions

No new facilities would be built until existing facilities are utilized to their capacity. Project level planning would evaluate the need to improve existing facilities or construct new facilities.

Impacts Common to All Alternatives

Most of the SDFO facilities are at the Fort Meade ACEC. Other facilities are in the vicinity of Ruby Flats in the Exemption Area. For the foreseeable future, the SDFO does not anticipate maintaining or constructing recreation facilities elsewhere in the planning area.

Facility design, location, construction, or maintenance would be influenced by management actions. Proposals for facilities that would not maintain, restore, or improve a sensitive resource would be mitigated, redesigned, sited in acceptable alternative locations, or in more extreme cases, denied altogether. Limitations and restrictions placed on facility proposals would depend on the locations and types of sensitive resources and potential environmental impacts to those resources. Proposals that require limitations or restrictions would incur greater costs in terms of project development; increased maintenance depending on whether specifications for these protective features require additional maintenance to ensure their effectiveness; or time delays.

Impacts under Alternative A (Current Management)

Within budget and management constraints, existing facilities would be maintained. Facilities damaged by weather or vandalism would be repaired. Structures deteriorating through age or functional obsolescence would be replaced with more modern designs to serve the same purpose. If an old location was found to be unsuitable due to cultural or resource concerns, its replacement would be built on a better site.

Existing management for recreation gradually increases the number of facilities to be constructed and maintained. Some existing facilities would be redesigned or improved at the project planning level. The Homestake Powder Houses would be maintained and adaptive reuse options for structures would be investigated.

The Fort Meade ACEC would receive a steady but slight increase in visitation throughout the life of the RMP. With maintenance and incremental improvements, existing facilities in ACECs would be adequate for foreseeable recreation uses. Portions of the Exemption Area with good public access would receive more recreation use than at present, mainly because of increased urbanization in the Lead-Deadwood area. Some routes through adjoining property that link up with trails on the Fort Meade ACEC or the public lands in the Exemption Area could become part of a designated trail network in cooperation with land owners, user groups and local governments.

Impacts under Alternative B

Management actions under Alternative B would increase the number of recreation facilities to be constructed and maintained. User fees would defray part of the maintenance expenses. This alternative would plan for the largest increase in recreation use at the Fort Meade ACEC and the Exemption Area. This alternative would mean more facilities and improvements at the Fort Meade ACEC. This alternative would designate the most non-motorized trails of all alternatives. Additional historic locations would have interpretive signage. If project level planning determines a need, more camping might be developed in or near the existing Alkali Creek sites, and the Fort Meade Reservoir enclosure would be considered for development into a small campground.

The greatest effect would be in the Exemption Area should it be designated as a SRMA. That designation could lead to some of its road and trails receiving scheduled maintenance construction of trailhead(s) for motorized and non-motorized recreation users. The BLM would cooperate with private landowners, users groups and local governments to develop a trail system. Maintenance and adaptive reuse of the Homestake Powder Houses would receive a higher priority. Historic locations would be interpreted. Some new permanent recreation picnicking and camping facilities with amenities would be constructed. The additional project level planning would evaluate the locations and types of facilities needed. The Ruby Flats vicinity would be evaluated for development into a recreation site because of its closeness to the Michelson trail, the existing Homestake Powder Houses, and road access.

Impacts under Alternative C

In Alternative C, the Fort Meade ACEC's present facilities would be maintained. Facility improvements would be primarily for health and safety, resource protection, and functional improvement. Some additional interpretation would be considered at the project level. Any facility improvements would not detract from the ACEC's primary purpose and would not conflict with site VRM classifications. In cooperation with partners, a smaller system of designated trails would be developed.

The Exemption Area would not be a SRMA. The Homestake Powder House would be maintained and considered for adaptive reuse. A smaller motorized and non-motorized road and trail system would be considered. There would not likely be new permanent recreational facilities in the Exemption Area.

In Alternative C, the Fort Meade ACEC would continue to have an annual increase of visitors due to urbanization of the surrounding area. Facility size might prevent the issuance of some Special Recreation Permits. The Exemption Area's close proximity to the Black Hills National Forest would result in continued interest and use by recreational users. There would be a slight increase in recreational use if trails were designated and the Powder Houses were converted to other uses.

Impacts under Alternative D (Preferred Alternative)

In Alternative D, the Fort Meade ACEC would continue to receive an annual increase of visitors due to urbanization of the surrounding area and its easy access from public highways. Present facilities at ACECs would be maintained. Facility improvements would be made to improve health and safety, resource protection, and functionality. Some additional facilities would be considered at the project level if there was a large enough increase in visitor use. These could include additional toilets, tent camping locations, and more spaces at the Horse Camp. The Fort Meade Reservoir

may be considered as an additional campground. It already has some of the amenities necessary for a fee site, but water from a nearby range water line would have to be made potable. But any facility improvements would not detract from the ACEC's primary purpose and would not conflict with the site VRM classification. Because of user conflicts and facilities limitations, the ACEC might not be able accommodate some Special Recreation Permit requests. In cooperation with partners, a system of designated non-motorized trails would be developed and maintained. Some historic sites with good public access would receive interpretive signage.

The Exemption Area would be a SRMA. Locations with good access would continue to receive its present level or a small increase of recreational users. The Homestake Powder Houses would be maintained and considered for adaptive reuse. The associated Ruby Flats area would be evaluated as a picnic and camping site because of its location near the Michelson Trail and seasonal vehicle access. The access road into the location would be maintained. A motorized and non-motorized road and trail system in the Exemption Area would be considered in cooperation with the state, local governments and willing private parties. Selected roads and trails would receive periodic maintenance.

Cumulative Impacts

No cumulative impacts would occur from implementation of the alternatives.

Social and Economic

Social

Assumptions for Social Conditions

For the social effects analysis, information from scoping and other planning documents and discussions with people knowledgeable about the planning area was used to develop a list of potentially affected groups and individuals, the concerns of these groups, and potential effects of changes in BLM management activities to these groups. Based on the concerns and potential effects, indicators related to changes in resource activities were identified for each potentially affected group. The indicators were examined by alternative for each group to estimate the potential social effects. The potential social effects were then discussed with resource experts to determine the likelihood of the effect for each group.

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 opportunities to develop oil and gas resources, and resolution or creation of problems related to these activities. Other less tangible things such as beliefs could also affect qualify of life. These include individuals believing they have a sense of control over the decisions that affect their future and believing that the government strives to act in ways that consider all stakeholder needs.

The groupings in this section are made to facilitate the discussion of social effects. It should be noted that these groupings generalize the members' 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. The social analysis will include the groups and individuals most likely to be affected by the plan.

The age of the national, regional and local populations will continue to increase. The economic, cultural, recreation, transportation, and visual resource assumptions and effects sections include information that may be of interest to the reader interested in the social environment.

Impacts Common to All Alternatives

No alternative would affect the major ongoing social trends or social organization in the local communities of the planning area.

Unless specifically prohibited on the lease, motorized cross-country travel would be allowed for BLM lease holders if such travel is essential to administer the lease. Continuing to be able to travel cross country for this purpose was a concern for permittees.

Under all alternatives, current levels of forage available for livestock grazing would be maintained so there would be no social effects to local communities from changes in AUMs. Under individual alternatives, there may be negative or positive effects to specific operators due to BLM actions. These actions could include land ownership adjustment, oil and gas or bentonite development, prescribed burns, and other activities.

Under all alternatives, the BLM will work closely with local communities, counties and other officials to prevent and treat invasive plant species including noxious weeds.

Under all alternatives, public safety will be a high priority.

While the act of leasing federal minerals itself would result in no social impacts, subsequent development of a lease may generate impacts to people living near or using the area in the vicinity of the lease. Oil and gas exploration, drilling, or production could create an inconvenience to these people due to increased traffic and traffic delays, air pollution, light, noise and visual impacts. This could be especially noticeable in rural areas where oil and gas development has been minimal. The amount of inconvenience would depend on the activity affected, traffic patterns within the area, noise and light levels, length of time, and season these activities occurred. Creation of new access roads into an area could allow increased public access and exposure of private property to vandalism. For leases where the surface is privately owned and the subsurface is BLM managed, surface owner agreements, standard lease stipulations, and BMPs could address many of the concerns of private surface owners.

Tribal Issues – Tribal Treaty Rights

The BLM, as a governmental agency, would maintain a special government-to-government relationship with federally recognized Indian tribes. Members of the tribes of the Standing Rock, Pine Ridge, Cheyenne River, Rosebud and Lower Brule reservations and other reservations exercise their hunting, fishing, and gathering rights on federal lands outside the boundaries of their reservation, including BLM-administered lands within the South Dakota Field Office. 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 Native Americans to exercise their treaty rights on public lands will continue and potentially increase. Under all of the alternatives, BLM-administered lands in the South Dakota Field Office could be used in land exchanges to acquire lands in other parts of the Montana/Dakotas, outside of the historical culture areas of the above-mentioned tribes. The net effect of such land tenure adjustments could be to limit or reduce the area within which tribal treaty rights could be exercised.

Environmental Justice

During the course of the analysis, no alternative considered resulted in any identifiable disproportionate effects specific to any minority or low income population or community. The agency has considered all input from persons or groups regardless of age, income status, race or other social or economic characteristics. Low income people do live in the study area but, aside from American Indians, they do not appear to be associated with any specific BLM resources or activities.

Impacts under Alternative A (Current Management)

This alternative would maintain the current livestock grazing management system including grazing preference, and would maintain the quality of life for livestock permittees. However, the potential for AUMs to be decreased on individual allotments by oil and gas and/or bentonite development would be greatest under this alternative.

Groups and individuals who give a high priority to resource protection, including soils, watersheds, vegetation and wildlife, would not feel this alternative offers enough protection for these resources. This alternative could result in a decline in the quality of life for these groups and individuals.

Groups and individuals who give a high priority to resource use would probably support this alternative because it has the fewest restrictions on oil and gas and other minerals development. Employment and income from all BLM sources would increase by 17 percent (72 long-term positions) compared to current conditions. BLM program revenues and payments to counties would increase by $506,000. In the long term, the population could increase by nearly 300 people and 125 households, which would be more likely to occur in the larger communities where the social effects would be less noticeable. However, any new employment and population would probably be welcomed in the very small communities that are currently losing population. Payments to counties from oil and gas development would accrue to the counties where production occurs. There revenues would benefit any receiving county but would be more notable in counties with smaller populations and less current revenue. Those who give a high priority to resource use include many local residents who are concerned about economic development and its potential positive effects on the social environment of small communities. This alternative would enhance the quality of life for these people because there would be substantial increases in economic activity from the present.

Recreation management under Alternative A would continue as it has in the past. Currently, an extensive public land area is accessible by motorized use for those enjoying dispersed recreation opportunities. The opportunities for non - motorized use for solitude could be diminished by dust, noise, and vehicle movement from nearby motorized use. Opportunities to retrieve game off road would not be allowed under this alternative, which could become more of a problem as the population ages.

Under this alternative, OHV activities could cause noise, visual intrusions and smells that make it more difficult for Native Americans to engage in their traditional religious practices. However, increased accessibility could better facilitate the traditional use of sacred locations by aging Native Americans. Mining, oil and gas development, and other activities could occur in the vicinity of cultural and sacred site areas that are used for traditional practices. Areas in the Black Hills and Bear Butte are particularly at risk. The visual and auditory disruptions from all these activities could interfere with the ability of Native Americans to practice their traditional religious activities in an unencumbered way, which could negatively affect the quality of life of those who engage in these practices.

Impacts under Alternative B

Under this alternative, the number of AUMS could increase, range improvements would emphasize livestock, and soil, water and wildlife requirements would be more relaxed than under Alternatives C or D. However, the potential for conflict between permittees and recreationists in the Exemption Area would increase, range improvements may require specific designs to meet visual requirements, and mineral activity would have a higher probability of affecting grazing allotments than under Alternative C because of higher levels of development. The change in criteria for allotment designation, which would occur under Alternatives B, C, and D, is also a concern to permittees because more intense BLM oversight of leases would occur if allotment categories change from C to I. This alternative would maintain the quality of life for livestock permittees.

Groups and individuals who give a high priority to resource protection, including soils, watersheds, vegetation and wildlife, would not feel this alternative offers enough protection for these resources. This alternative could result in a decline in the quality of life for these groups and individuals.

Groups and individuals who give a high priority to resource use may not support this alternative because it has much less oil and gas and wind energy development than Alternative A. However, employment and income from all BLM sources would increase by 6 percent (26 long-term positions) compared to current conditions. BLM program revenues and payments to counties would increase by $203,000, which is less than half of the increase under Alternative A but is still more than current. In the long term, the population could increase by nearly 120 people and 51 households which would more likely occur in the larger communities where the social effects would be less noticeable. However, any new employment and population would probably be welcomed in the very small communities that are currently losing population. Payments to counties from oil and gas development would accrue to the counties where production occurs. Revenues would benefit any receiving county but would be more notable in counties with smaller populations and less current revenue. Those who give a high priority to resource use include many local residents who are concerned about economic development and its potential positive effects on the social environment of small communities. This alternative would probably maintain the quality of life for these people because there would be some increase in economic activity compared to the present situation.

Recreation management under Alternative B would emphasize motorized use including designation of the Exemption area as a SRMA. In addition, game retrieval off road would be allowed under this alternative, which could provide more alternatives for an aging population. The emphasis on landscape aesthetics and watershed, soils, and fish and wildlife habitat would enhance recreation quality to a greater extent than Alternative A, but less than Alternatives C and D. Conflicts between permittees and recreationists in the Exemption Area could increase because of increased OHV use. The opportunities for non-motorized use for solitude could be diminished by dust, noise, and vehicle movement from nearby motorized use. Under this alternative, opportunities for these types of activities may decline.

Under this alternative, increasing OHV activities could cause noise, visual intrusions and smells that make it more difficult for Native Americans to engage in their traditional religious practices. However, increased accessibility could better facilitate the traditional use of sacred locations by aging Native Americans. Mining, oil and gas development, and other activities could occur in the vicinity of cultural and sacred site areas that are used for traditional practices. Areas in the Black Hills and Bear Butte are particularly at risk. The visual and auditory disruptions from all these activities could interfere with the ability of Native Americans to practice their traditional religious activities in an unencumbered way, which could negatively affect the quality of life of those who engage in these practices.

Impacts under Alternative C

Under this alternative, the number of AUMs would remain the same as under Alternative A, the potential for recreation conflict in the Exemption Area would not increase as compared to Alternatives B and D, and mineral activity would have a lower probability of affecting grazing allotments than under any other alternative because of lower levels of development. However, range improvements would emphasize watershed protection, treatment for noxious weeds would be the most restricted under this alternative, and soil, water and wildlife requirements would be more stringent than under any other alternative. The change in criteria for allotment designation, which would occur under Alternatives B, C, and D, is also a concern to permittees because more intense BLM oversight of leases would occur if allotment categories were changed from C to I. Under this alternative, the quality of life for livestock permittees would be maintained.

Groups and individuals who give a high priority to resource protection, including soils, watersheds, vegetation and wildlife, may feel this alternative offers adequate protection for these resources. This alternative could enhance the quality of life for these groups and individuals.

Groups and individuals who give a high priority to resource use may not support this alternative because it has much less oil and gas and wind energy development than Alternative A, and slightly less than Alternative B. However, employment and income from all BLM sources would increase by 6 percent (26 long-term positions) compared to current conditions. BLM program revenues and payments to counties would increase by $197,000, which is less than half of the increase under Alternative A but is still more than current. In the long term, the population could increase by nearly 103 people and 44 households, which would be more likely to occur in the larger communities where the social effects would be less noticeable. However, any new employment and population would probably be welcomed in the very small communities that are currently losing population. Payments to counties from oil and gas development would accrue to the counties where production occurs. Revenues would benefit any receiving county but would be more notable in counties with smaller populations and less current revenue. Those who give a high priority to resource use include many local residents who are concerned about economic development and its potential positive effects on the social environment of small communities. This alternative would probably maintain the quality of life for these people because there would be some increase in economic activity compared to the present situation.

Recreation management under Alternative C would emphasize non-motorized use; the Exemption Area would not be designated as a SRMA. Opportunities to retrieve game off road would not be allowed under this alternative, which could become more of a problem as the population ages; this would be consistent with adjacent state and Forest Service management. The emphasis on landscape aesthetics and watershed, soils, and fish and wildlife habitat would enhance recreation quality to a greater extent than under any other alternative. The opportunities for non- motorized use for solitude would be enhanced under this alternative. However, demand for OHV opportunities continues to grow and this demand would not be met under Alternative C.

Under this alternative, OHV activities, although less than under all other alternatives, could cause noise, visual intrusions, and smells that make it more difficult for Native Americans to engage in their traditional religious practices. However, increased accessibility could better facilitate the traditional use of sacred locations by aging Native Americans. Mining, oil and gas development, and other activities could occur in the vicinity of cultural and sacred site areas that are used for traditional practices. Areas in the Black Hills and Bear Butte are particularly at risk. The visual and auditory disruptions from all these activities could interfere with the ability of Native Americans to practice their traditional religious activities in an unencumbered way, which could negatively affect the quality of life of those who engage in these practices. The effects under this alternative would be less than for all the other alternatives because mineral and other development is more restricted, and non-motorized use and landscape aesthetics would be emphasized.

Impacts under Alternative D (Preferred Alternative)

Under this alternative, the number of AUMs could increase, range improvements would emphasize both livestock and watershed protection, and soil, water, and wildlife requirements would be more relaxed than under Alternative C but greater than Alternatives A and B. However, the potential for recreation conflict in the Exemption Area would increase, range improvements may require specific designs to meet visual requirements, and mineral activity would have a higher probability of affecting grazing allotments than under Alternative C because of higher levels of development. The change in criteria for allotment designation, which would occur under Alternatives B, C, and D, is also a concern to permittees because more intense BLM oversight of leases would occur if allotments categories were changed from C to M. This alternative would maintain the quality of life for livestock permittees.

Groups and individuals who give a high priority to resource protection, including soils, watersheds, vegetation and wildlife, may feel this alternative offers enough protection for these resources. This alternative could maintain the quality of life for these groups and individuals.

Groups and individuals who give a high priority to resource use may not support this alternative because it has much less oil and gas and wind energy development than Alternative A and is very similar to Alternative B. However, employment and income from all BLM sources would increase by 6 percent (26 long-term positions) compared to current conditions. BLM program revenues and payments to counties would increase by $213,000, which is less than half of the increase under Alternative A but is still more than current. In the long term, the population could increase by nearly 151 people and 51 households, which would be more likely to occur in the larger communities where the social effects would be less noticeable. However, any new employment and population would probably be welcomed in the very small communities that are currently losing population. Payments to counties from oil and gas development would accrue to the counties where production occurs. Revenues would benefit any receiving county but would be more notable in counties with smaller populations and less current revenue. Those who give a high priority to resource use include many local residents who are concerned about economic development and its potential positive effects on the social environment of small communities. This alternative would probably maintain the quality of life for these people because there would be some increase in economic activity compared to the present situation.

Recreation management under Alternative D would emphasize motorized use including designation of the Exemption Area as a SRMA. Opportunities to retrieve game off road would not be allowed under this alternative, which could become more of a problem as the population ages; this would be consistent with adjacent state and Forest Service management. The emphasis on landscape aesthetics and watershed, soils, and fish and wildlife habitat would enhance recreation quality to a greater extent than under any other alternative except Alternative C. Conflicts between permittees and recreationists in the Exemption Area could increase because of increased OHV use. The opportunities for non-motorized use for solitude could be diminished by dust, noise, and vehicle movement from nearby motorized use. These types of opportunities may decline under this alternative.

Under this alternative OHV activities, although less than under Alternatives A and B, could cause noise, visual intrusions, and smells that make it more difficult for Native Americans to engage in their traditional religious practices. However, increased accessibility could better facilitate the traditional use of sacred locations by aging Native Americans. Mining, oil and gas development, and other activities could occur in the vicinity of cultural and sacred site areas that are used for traditional practices. Areas in the Black Hills and Bear Butte are particularly at risk. The visual and auditory disruptions from all these activities could interfere with the ability of Native Americans to practice their traditional

religious activities in an unencumbered way, which could negatively affect the quality of life of those who engage in these practices.

Cumulative Impacts

Cumulative Impacts under Alternative A (Current Management)

Adoption of Alternative A could contribute to an increasing concern regarding wildlife, fisheries, and watershed issues to individuals who place a high priority on protection of these resources. On the other hand, this alternative would meet the needs of people and groups who feel present grazing management should be continued and resource use should be enhanced.

Cumulative Impacts under Alternative B

Adoption of Alternative B could contribute to an increasing concern regarding wildlife, fisheries, and watershed issues to individuals who place a high priority on protection of these resources. On the other hand, this alternative would meet the needs of people and groups who feel present grazing management should be continued and resource use should be maintained.

Cumulative Impacts under Alternative C

Adoption of Alternative C could contribute to an increasing concern among local people and those who support resource use that local cultural and economic interests are not being adequately protected. Individuals and groups who place a high priority on resource protection would feel this plan moves resource management in the right direction.

Cumulative Impacts under Alternative D (Preferred Alternative)

Under Alternative D, people who support resource use and those who support resource development may feel this alternative meets many of their needs and moves in the right direction because a variety of opportunities are available for each resource.

Economic

Assumptions and Guidelines

General: Potential economic impacts are assessed using the Forest Economic Analysis Spreadsheet Tool (FEAST) developed by the USDA Forest Service Inventory and Monitoring Institute (IMI) in Fort Collins, Colorado. This model uses a Microsoft Excel workbook as the interface between user inputs and data generated using the IMPLAN input-output modeling system.

The FEAST analysis assesses the economic impacts of the resource outputs projected under each alternative. Resource outputs in this context are the amount of a resource (e.g., timber volume, 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 the 20-year planning period based on the best available information and professional judgment. Impacts to economic well-being are measured in terms of employment and labor income.

Employment and labor income estimates developed for this analysis include direct, indirect, and induced economic effects. Direct employment would, for example, be generated in the cattle ranching and farming sectors. Additional employment would be generated as the affected cattle ranching operations purchase services and materials as inputs (“indirect” effects) and employees spend their earnings within the local economy (“induced” effects).

Sufficient funding and personnel would be available to implement any 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 herein.

Livestock Grazing: Market prices were used to gauge revealed willingness to pay for livestock grazing on BLM land. The difference between market prices for livestock grazing and the fee charged by the BLM represents an average annual consumer surplus to the BLM grazing operators of an estimated $1.3 million for each alternative.

The estimated average annual level of authorized grazing use for all alternatives would be based on 1999-2009 use levels (BLM Rangeland Administration System). These levels are: cattle/calves (53,456 AUMs), horses (177 AUMS), sheep and goats (8,850 AUMs). Based on a BLM grazing fee of $1.35 per AUM, total federal revenues from livestock grazing in all areas except Fort Meade would be about $82,000 for each alternative. Federal revenues from Fort Meade would continue to average about $66,000 per year. Approximately $74,000 of these federal revenues would be distributed to the local counties.

Oil/Gas: It is assumed that all the federal minerals (165,882 acres) that have been nominated for oil and gas leasing but deferred from leasing pending completion of the RMP will be leased within the one year of completing the RMP. Anticipated levels of leasing, development, and production by alternative are provided in Table 4-80. This is the basis for much of the economic impacts associated with BLM-managed mineral uses.

Locatable Minerals: It is assumed that 19,380 short tons of bentonite and 12,610 pounds of uranium oxide would be produced annually from unpatented mining claims under each of the alternatives. (Although uranium mining is anticipated over a nine year period, average annual production is spread over a 20-year plan life.) Production of gold and cement-grade limestone is not anticipated from unpatented mining claims during the life of the plan.

Recreation: Projected recreation visits and expenditures are distributed among different types of visitors based on the results of National Visitor Use Monitoring Surveys conducted for the Black Hills National Forest and Dakota Prairies National Grasslands.

The ratios of recreation visits to jobs and income used to assess the impacts of the alternatives are based on national ratios developed through the Forest Service's National Visitor Use Monitoring program.

The benefit transfer method was used to estimate non-market economic values related to recreation opportunities by transferring available information from studies already completed in other locations. Loomis (2005) summarizes more than 30 years of literature on net economic value of outdoor recreation on BLM land. The report provides average net willingness to pay or consumer surplus for 30 recreation activities at the national level.

Table 4-80
Average Annual Federal Mineral Production and Activity by Alternative

Commodity/Activity	*Existing Level*	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Existing acres leased	101,731	101,731	101,731	101,731	101,731
Acres deferred pending completion of RMP	0	165,882	165,882	165,882	165,882
Total acres leased	101,731	267,613	267,613	267,613	267,613
Acres held by production	36,561	96,177	96,177	96,177	96,177
Acres subject to rent	65,170	171,436	171,436	171,436	171,436
Lease rental first 5 years ($1.50/acre)	$48,878	$128,577	$128,577	$128,577	$128,577
Lease rental second 5 years ($2.00/acre)	$65,170	$171,436	$171,436	$171,436	$171,436
Average bonus ($3.88/acre)	$39,472	$103,834	$103,834	$103,834	$103,834

Table 4-80
Average Annual Federal Mineral Production and Activity by Alternative

Commodity/Activity	*Existing Level*	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Total annual federal lease and rental revenue	$153,519	$403,847	$403,847	$403,847	$403,847
Distribution to state/local government	$75,224	$197,885	$197,885	$197,885	$197,885
Annual oil production (bbl)	176,444	239,856	191,374	188,823	191,374
Annual gas production (MCF)	206,353	280,514	223,814	220,830	223,814
Federal oil royalty (bbl x $89.14 x 0.125)	$1,966,024	$2,672,592	$2,132,387	$1,496,652	$2,132,387
Federal gas royalty (MCF x $8.10 x 0.125)	$208,932	$284,020	$226,612	$159,051	$226,612
Total annual federal oil and gas royalties	$2,174,957	$2,956,612	$2,358,999	$1,655,703,0	$2,358,999
Distribution to state/local government	$1,065,729	$1,448,740	$1,155,910	$896,0007	$1,155,910
Total annual federal revenues	$2,328,476	$3,360,459	$2,762,846	$1,881,857	$2,762,846
Total annual state/local revenues	$1,140,953	$1,646,625	$1,353,794	$922,1104	$1,353,794
Total annual revenue distributed to counties	$1,140,953	$1,646,625	$1,353,794	$922,110	$1,353,794
Bentonite (short tons)	19,380	19,380	19,380	19,380	19
Uranium (lbs.)	0	12,610	12,610	12,610	12

Ecosystem Services: No attempt has been made to assign monetary values to the ecosystem services (e.g., benefits associated with watershed processes, soil stabilization and erosion control, improved air quality, climate regulation and carbon sequestration, and biological diversity) that would be provided because these values are difficult to quantify at this analysis level. However, the fact that no monetary value is assigned to ecosystem services in this document does not lessen their importance in the decision making process.

Fire/Fuels: Wildfire suppression costs are not provided by alternative because it is not possible to predict the level of wildfire that would occur under any of the alternatives or whether or not hazardous fuels treatments and wildfire for resource benefit reduce suppression costs (Omi 2008).

Timber: All sawtimber harvested within the analysis area would be logged by logging contractors, not households.

Sawtimber would be sold at the adjusted base period price for ponderosa pine for timber sales in the Black Hills zone at $41.94 per CCF.

Lands/Realty: Annual ROW rental revenues would remain about the same with all alternatives. The BLM currently receives about $2,000 in ROW rental revenue.

The basis for impact analysis also includes the development of wind energy on BLM land. The National Renewable Energy Laboratory developed a Jobs and Economic Development Impact (JEDI) Model to demonstrate economic impacts associated with energy development including wind energy development. It is assumed that one wind energy project would occur on BLM-administered land. This project would include towers located on BLM-administered land.

Government Contribution: Anticipated annual BLM expenditures for each alternative would be similar to the FY 2010 BLM budget for the South Dakota Field Office. The FY 2010 budget was $2.947 million ($1.523 for labor and $1.424 for non-labor expenditures (BLM, MIS 2010)). The number of permanent and other than permanent BLM employees would not vary by alternative. Each alternative would have 15 permanent and 10 other than permanent employees.

Population and Households: Currently there are 1.56 people for every job in the planning area. The same ratio is applied to the change in total jobs from current levels to estimate total population effects. Within the 11-county local economy there are about 0.66 households per job. This relationship was used to estimate the number of households with each alternative.

Impacts Common to All Alternatives

The potentially affected local economy is characterized for the planning area counties in the Affected Environment portion of this document (Chapter 3). None of the alternatives would be expected to affect economic diversity (the number of economic sectors) or economic dependency, which occurs when the local economy is dominated by a limited number of industries. While the alternatives have the potential to affect local businesses and individuals, the contribution of BLM-related activities to the local economy and the relative differences between the alternatives would not be large enough to have measurable effects on economic diversity or dependency. This is also the case with respect to economic stability, which is typically assessed in terms of seasonal unemployment, sporadic population changes, and fluctuating income growth rates. BLM-related activities include recreation, which is characterized by seasonal employment, but none of the alternatives would be expected to affect existing trends in this or other industries.

Livestock Grazing: Livestock grazing on BLM-administered land would continue to involve approximately the same number of operators. The average annual amount of authorized livestock grazing (actual use) would not change among the alternatives and the BLM would continue to provide about the same amount of the total forage for livestock. The dependency on BLM forage for each county would remain relatively unchanged. The economic dependency of livestock producers on BLM forage would also remain unchanged. BLM forage often would continue to provide a critical element of some livestock producers' complement of grazing, forage, and hay production. All alternatives would continue to authorize average annual grazing of approximately 62,270 AUMs on BLM-administered land. The portion of total livestock production that is supported by BLM forage would support an estimated 50 total jobs and $3.3 million in total wage and proprietor's income within the local economy. Annual federal revenues from livestock grazing fees would continue to be about $148,000 annually, of which about $74,000 would be distributed to the counties. The difference between market prices for livestock grazing and the fee charged by the BLM represents an annual average consumer surplus to the BLM grazing operators of an estimated $1.3 million for each alternative.

Leasable and Locatable Minerals: Federal mineral estate leased for oil and gas exploration, development, and production would increase by 165,882 acres when those areas that are currently deferred from leasing are made available for leasing upon completion of the RMP. An estimated annual average 96,177 acres would have leases held by production and an estimated 171,436 acres would be subject to annual rents. Average annual revenues from leasing federal minerals for oil and gas development and associated rents would increase from the current $154,000 to an estimated $404,000. Most of the oil and gas production from federal minerals would continue to occur in Harding County.

An estimated average 19,380 short tons of bentonite and 12,610 pounds of uranium oxide would be produced annually from unpatented mining claims under each of the alternatives. Employment and income impacts displayed in Tables 4-81 and 4-82 under the minerals program include the anticipated effects of bentonite and uranium production. Mineral-related activities would contribute the most income and employment compared to other major land/mineral use categories.

Recreation Use: The estimated average annual level of recreation use would be 186,900 visits per year and would support about 120 jobs and $3.3 million in labor income (Tables 4-81 and 4-82) for all alternatives. Revenues from recreation use permits, campground receipts, and outfitter and guide receipts would be similar (average approximately $2,900 per year) for all alternatives. The willingness to pay for recreation opportunities would represent an estimated annual average consumer surplus of $11.0 million for all alternatives.

Timber Management: Although average annual timber sales volume and revenue would vary among alternatives, the amount of related revenue that goes to the state would remain about the same as current levels for all alternatives.

Lands and Realty: Existing use authorizations (e.g. rights-of-way, permits, and lease rentals) would continue to generate an estimated $2,000 of revenue annually for the federal government; and annual Payments in Lieu of Taxes (PILT) from the federal government to 23 counties would continue to be approximately $570,000 with all the alternatives. Since no specific major land tenure adjustments are pending, it is not possible to determine if or how PILT and local property taxes might be affected.

Wind energy development is anticipated with each of the alternatives. The annual rental revenue to the federal government would be $4,155 per megawatt of the total anticipated installed capacity of the wind energy project on BLM-administered lands (BLM, IM 2009-043). There is no statutory authority to share FLPMA ROW revenues with states or counties.

Hoen, Wiser, Cappers, Thayer, and Sethi (2009) used mulit-site hedonic analysis to address the impact of wind power projects on residential property values in the United States. They collected data on almost 7,500 sales of single-family homes situated within 10 miles of 24 existing wind facilities in nine different U.S. states. The study conclusions were based on eight different hedonic pricing models and repeat and sales volume models. None of the models uncovered conclusive evidence of widespread property value impacts in communities surrounding the wind facilities. Neither the views of the towers nor the distances of the home from these facilities were found to have a consistent, measurable, or statistically significant effect on home sale prices. The study concluded that if individual homes or small numbers of homes were negatively impacted, the impacts were either too small and/or too infrequent to result in widespread, statistically observable impacts.

BLM Government Operations*:* Expenditures for BLM employee salaries and program operations would continue to be about $2.9 million annually. The BLM would continue to employ about 25 employees (15 permanent and 10 other than permanent) in South Dakota. Non-salary expenditures are purchases made in support of resource programs and operations and include items such as contracts, gasoline, diesel, animal feed, computer equipment, and fencing materials. Operations expenditures also include contracts and cooperative agreements for fire and fuels treatments, invasive weed treatments, and other activities related to ecosystem restoration that are paid for by the BLM. It is estimated that BLM labor and non-labor expenditures would continue to support about 50 jobs and $3.0 million in income (Tables 4-81 and 4-82) in the local economies.

Other BLM Government Operations (Noxious Weeds and Other Invasive Species): Annual average ecosystem restoration would include commercial timber harvest, pre-commercial thinning, prescribed burning, and treating weeds and invasive species. Invasive species treatments would occur on about 566 acres per year. About three-fourths of these treatments would be completed through agreements/contracts. The remaining weed treatments would be done by BLM employees. Average treatment cost per acre would be $104.34 and average total annual cost of weed treatments would be $42,661.

Other BLM Government Operations (Fire and Fuels Management): Fire and fuels treatments may include pre-commercial thinning and prescribed burning. Hazardous fuel treatment costs are included for the purposes of this analysis in the total BLM expenditures identified by alternative. Mechanical treatment cost for hazardous fuels would average about $530 per acre and prescribed burning would average $190 per acre. Projected annual hazardous fuels treatment costs range from approximately $224,000 under Alternative A to approximately $402,000 under Alternatives B and D. Other potential wildfire-related costs (such as property loss, lost revenues, and increased suppression costs) are difficult to project and are unknown. It is commonly accepted that fire suppression costs and risk to life and property should be less on wildfires that occur where hazardous fuels have been treated with a combination of mechanical treatments, prescribed burns, etc. compared to areas where fuels have not been reduced. For example, fires generally burn hotter, flame length is higher, and fires in tree canopies are more likely in non-treated areas.

The alternatives involve different approaches to, and levels of, vegetation treatment, as well as different approaches to wildfire management. Generally, treating hazardous fuels would tend to reduce the threat to life and property nearby. It is not, however, possible to project the level of non-prescribed wildfire that would occur under any of the alternatives. Based on the level of hazardous fuels treatments for each alternative, total wildfire suppression costs for fires would be the same for all alternatives.

Cumulative Impacts

The description of the Affected Environment found in Chapter 3 summarizes the past and present activities that influenced cumulative economic conditions. It also summarizes those economic conditions. The economic analysis takes into account

past actions that eventually evolved to the present economic situation. The alternative actions shown in this section indicate how the local economy would change from the anticipated land uses with each alternative. Finally, a list of potential future projects and developments were discussed during meetings with the public at the community economic workshops and at internal interdisciplinary team meetings.

Levels of oil and gas leasing, development, and production as well as wind energy development are land/mineral uses that would increase with all alternatives. These increases would cause total employment, wage and proprietor's income, and public revenues to the federal, state and local governments to also increase with all alternatives. The level of increase would vary among the alternatives and is summarized below for each alternative.

Most of the economic impacts from BLM management and land uses would continue to occur in Butte, Harding, and Meade counties where most of the BLM land and minerals and associated uses are located. The dependency of the local economy on the livestock industry, timber production, mining, and recreation activities would not be affected by BLM resource management. The influence of resource management on BLM-administered land would not change local economic diversity (as indicated by the number of economic sectors), dependency (i.e. where one or a few industries dominate the economy), or stability (as indicated by seasonal unemployment, sporadic population changes, and fluctuating income rates). The population density, number of industrial sectors, and average income per household would continue to be about the same as current levels with all alternatives.

Impacts by Alternative

Total employment and labor and proprietor's income by major land/mineral use category are shown for each alternative in Tables 4-81 and 4-82. Public revenues by major BLM land/mineral use are shown in Table 4-83; and the change in economic contribution from current levels for each alternative is displayed in Table 4-84. The economic effects, especially the employment, income, and revenue effects of BLM resource management would be spread unequally among the counties and communities within the planning area.

Table 4-81
Employment by Resource Use and Other Contribution to Local Economy by Alternative
(Average Annual)

	Total Number of Jobs Contributed				
Resource Use	***Existing Level***	***Alternative A (Current Management)***	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
Livestock Grazing	45	45	45	45	45
Minerals	174	238	197	133	197
Recreation	124	124	124	124	124
Timber	14	13	13	12	13
Wind Energy	0	116	51	43	71
Payments to Counties	26	35	30	30	30
BLM Expenditures	49	49	49	49	49
Total BLM Management	432	504	458	436	458
Percent Change from Current		16.67%	6.02%	0.9%	6.02%

Source: FEAST/IMPLAN (2007)

Table 4-82
Income by Resource Use and Other Contribution to Local Economy by Alternative
(Average Annual, $1,000)

	Total Local Income Contributed				
Resource Use	***Existing Level***	***Alternative A (Current Management)***	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
Livestock Grazing	3,281	3,281	3,281	3,281	3,281
Minerals	5,583	8,176	6,942	6,876	6,942
Recreation	3,281	3,281	3,281	3,281	3,281
Timber	558	533	496	467	496
Wind Energy	0	4,489	1,990	1,663	2,745
Payments to Counties	1,030	1,355	1,167	1,157	1,167
BLM Expenditures	3,032	3,032	3,032	3,032	3,032
Total BLM Management	16,765	24,147	20,189	19,757	20,944
Percent Change from Current		44.03%	20.42%	17.85%	24.93%

Source: FEAST/IMPLAN (2007)

Table 4-83
Federal, State, and Local Revenues by Alternative ($1000)

Resource Use	***Existing Level***	***Alternative A (Current Management)***	***Alternative B***	***Alternative C***	***Alternative D (Preferred Alternative)***
Federal					
Livestock grazing	148	148	148	148	148
Oil/gas leases, rents, royalties	2,328	3,360	2,763	2,731	2,763
Recreation use permits	3	3	3	3	3
Timber sales	85	81	75	70	75
ROW rents	2	2	2	2	2
Wind energy rents	0	2,879	1,280	1,064	1,762
Total	2,566	5,356	4,271	4,018	4,753
State/Counties					
Livestock grazing	74	74	74	74	74
Oil/gas leases, rents, royalties	1,141	1,647	1,354	1,338	1,354
PILT	570	570	570	570	570
Timber sales	3	3	3	3	3
Weeds	31	31	31	31	31
Total	1,819	2,325	2,032	2,016	2,032

Table 4-84
Comparison of Estimated Average Annual Economic Contributions from BLM Land and Mineral Uses

Economic Indicator (Change from Current Levels)	*Alternative A (Current Management)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Change in total local employment (full and part-time jobs)	188	77	66	97
Change in total local income ($1,000)	7,382	3,424	2,992	4,179
Change in Federal revenue ($1,000)	2,790	1,705	1,452	2,187
Change in local revenue ($1,000)	506	213	197	213
Change in local population	293	120	103	151
Change in number of households	124	51	44	64

Impacts under Alternative A (Current Management)

In addition to the economic impacts summarized above under Impacts Common to All Alternatives, the economic impacts of Alternative A are described below. Estimates of employment and labor and proprietor's income that would be supported by Alternative A are based on anticipated land and mineral uses, resource outputs, and projected BLM expenditure levels. The most notable changes in BLM land/mineral uses would be increased oil and gas leasing and related production and renewable wind energy development. Estimated average annual employment and labor/proprietor's income are summarized by major resource use in Tables 4-81 and 4-82, respectively. Public revenues by major BLM land/mineral use are shown in Table 4-83; and the change in economic contribution from current levels for each alternative displayed in Table 4-84. Mineral exploration, development, and production would be the BLM-related activities that contribute the most employment and income to the local economy.

Livestock Grazing: Economic impacts associated with livestock grazing on BLM-administered land are summarized above under Impacts Common to All Alternatives.

Mineral Leasing, Exploration, and Production: Average annual oil production would increase to an estimated 239,856 barrels of oil, and natural gas production would increase to an estimated 280,514 MCF. It is estimated that minerals exploration, development, and production on federal minerals would support about 240 local jobs and an estimated $8.2 million in local labor and proprietor's income (Tables 4-81 and 4-82). Total average annual federal revenues associated with mineral leasing, rents, and production royalties on federal minerals would increase from current estimated levels ($2.3 million) to an estimated $3.4 million. From this, annual average revenues disbursed to the counties would be about $1.6 million, an increase of an estimated $1.7 million (Table 4-83).

Recreation: Economic impacts associated with recreation use on BLM land are summarized above under Impacts Common to All Alternatives.

***Timber Harvest*:** Average annual timber harvest would produce about 1,930 CCF of sawtimber. Current adjusted base period price of ponderosa pine that is used in appraising timber sales in the Black Hills zone is $41.94 per CCF (Forest Service Region 2, Appraisal Bulletin, Oct. 2010). Four percent of the revenue from timber sales on public domain goes to the state. Annual revenues from timber sales would be an estimated $81,000, of which about $3,000 would be distributed to the State of South Dakota.

Lands and Realty: The development of renewable wind energy on public lands would stimulate economic activity from the construction and operation of the towers and related infrastructure. ROW payments to the federal government would also increase from current levels. More wind energy development would be anticipated with Alternative A than with any of the other alternatives. One or more wind energy developments with a total of 198 towers (capacity of 693 MW) on BLM lands would be anticipated with Alternative A. This would support up to 3,280 local jobs and an estimated $126.5 million in labor income during the two-year construction period (JEDI 2011). After the two-year construction period, average annual

operation and maintenance would contribute about 120 jobs and $4.489 million in wage and proprietor's income. It would generate about $1.76 million in annual federal ROW rent revenues.

Impacts under Alternative B

In addition to the economic impacts summarized above under Impacts Common to All Alternatives, the economic impacts of Alternative B are described below. Estimates of employment and labor and proprietor's income that would be supported by Alternative B are based on anticipated land and mineral uses, resource outputs, and projected BLM expenditure levels. Estimated average annual employment and labor/proprietor's income are summarized by major resource use in Tables 4-81 and 4-82, respectively. Most of the anticipated changes in economic contributions under Alternative B would occur because of wind energy development and changes in minerals management and the subsequent reduction in wells drilled and oil and gas produced. Mineral exploration, development, and production would be the BLM-related activities that contribute the most employment and income to the local economy.

Livestock Grazing: Economic impacts associated with livestock grazing on BLM-administered land are summarized above under Impacts Common to All Alternatives.

Leasable and Locatable Minerals: Average annual oil production would increase to an estimated 191,000 bbls and natural gas production would increase to an estimated 224,000 MCF. It is estimated that minerals exploration, development, and production on federal minerals would support about 200 local jobs and an estimated $6.9 million in local labor and proprietor's income (Tables 4-81 and 4-82). Total average annual federal revenues associated with mineral leasing, rents, and production royalties on federal minerals would increase from current estimated levels ($2.3 million) to an estimated $2.8 million. From this, annual average revenues disbursed to the counties would be about $1.4 million, an increase of an estimated $210,000 (4-81).

Recreation: Economic impacts associated with recreation use on BLM land are summarized above under Impacts Common to All Alternatives.

***Timber Harvest*:** Average annual timber harvest would produce about 1,790 CCF of sawtimber. Current adjusted base period price of ponderosa pine that is used in appraising timber sales in the Black Hills zone is $41.94 per CCF (Forest Service Region 2, Appraisal Bulletin, Oct. 2010). Four percent of the revenue from timber sales on public domain goes to the state; and annual revenues from timber sales would be an estimated $75,000, of which about $3,000 would be distributed to the State of South Dakota.

Lands and Realty: The development of renewable wind energy on public lands would stimulate economic activity from the construction and operation of the towers and related infrastructure. ROW payments to the federal government would also increase from current levels. One or more wind energy developments with a total of 88 towers (capacity of 308 MW) on BLM-administered lands would be anticipated with Alternative B. This would support up to 1,459 local jobs and an estimated $56.2 million in labor income during the two-year construction period (JEDI 2011). After the two-year construction period, average annual operation and maintenance would contribute about 50 jobs and $1.990 million in wage and proprietor's income. It would generate about $1.28 million in annual federal ROW rent revenues.

Government: Fire/fuels treatments would average 400 acres of mechanical treatments and 1,000 acres of prescribed burning. Average annual cost of pre-commercial thinning would be an estimated $212,000. Most prescribed burning would be done by BLM personnel and cooperating agencies. Costs of prescribed burning would be included in government operations costs.

Impacts under Alternative C

In addition to the economic impacts summarized above under Impacts Common to All Alternatives, the economic impacts of Alternative C are described below. Estimates of employment and labor and proprietor's income that would be supported by Alternative C are based on anticipated land and mineral uses, resource outputs, and projected BLM expenditure levels. Estimated average annual employment and labor/proprietor's income are summarized by major resource use in Tables 4-81 and 4-82, respectively.

Livestock Grazing: Economic impacts associated with livestock grazing on BLM land are summarized above under Impacts Common to All Alternatives.

Leasable and Locatable Minerals: Average annual oil production would increase to an estimated 189,000 bbls and natural gas production would increase to an estimated 221,000 MCF. It is estimated that minerals exploration, development, and production on federal minerals would support about 200 local jobs and an estimated $6.9 million in local labor and proprietor's income (Tables 4-81 and 4-82). Total average annual federal revenues associated with mineral leasing, rents, and production royalties on federal minerals would increase from current estimated levels ($2.3 million) to an estimated $2.7 million. From this, annual average revenues distributed to the counties would be about $1.3 million, an increase of about $200,000 (Table 4-83).

Recreation: Economic impacts associated with recreation use on BLM-administered land are summarized above under Impacts Common to All Alternatives.

***Timber Harvest*:** Average annual timber harvest would produce about 1,680 CCF of sawtimber. Current adjusted base period price of ponderosa pine that is used in appraising timber sales in the Black Hills zone is $41.94 per CCF (Forest Service Region 2, Appraisal Bulletin, Oct. 2010). Four percent of the revenue from timber sales on public domain goes to the state; and annual revenues from timber sales would be an estimated $70,000, of which about $3,000 would be distributed to the State of South Dakota.

Lands and Realty: The development of renewable wind energy on public lands would stimulate economic activity from the construction and operation of the towers and related infrastructure. ROW payments to the federal government would also increase from current levels. One or more wind energy developments with a total of 73 towers (capacity of 256 MW) on BLM-administered lands would be anticipated with Alternative C. This would support up to 1,210 local jobs and an estimated $46.74 million in labor income during the two-year construction period (JEDI 2011). After the two-year construction period, average annual operation and maintenance would contribute about 40 jobs and $1.66 million in wage and proprietor's income. It would generate about $1.06 million in annual federal rights-of-way rent revenues.

Government: Fire/fuels treatments would average 350 acres of mechanical treatments and 500 acres of prescribed burning. Average annual cost of pre-commercial thinning would be an estimated $186,000. Since most prescribed burning would be done by BLM personnel and cooperating agencies, costs of prescribed burning would be included in government operations costs.

Impacts under Alternative D (Preferred Alternative)

In addition to the economic impacts summarized above under Impacts Common to All Alternatives, the economic impacts of Alternative D are described below. Estimates of employment and labor and proprietor's income that would be supported by Alternative D are based on anticipated land and mineral uses, resource outputs, and projected BLM expenditure levels. Estimated average annual employment and labor/proprietor's income are summarized by major resource use in Tables 4-81 and 4-82, respectively. Mineral exploration, development, and production would be the BLM-related activities that contribute the most employment and income to the local economy.

Livestock Grazing: Economic impacts associated with livestock grazing on BLM-administered land are summarized above under Impacts Common to All Alternatives.

Leasable and Locatable Minerals: Average annual oil production would increase to an estimated 475,000 bbls and natural gas production would increase to an estimated 440,000 MCF. It is estimated that minerals exploration, development, and production on federal minerals would support about 200 local jobs and an estimated $6.9 million in local labor and proprietor's income (Tables 4-81 and 4-82). Total average annual federal revenues associated with mineral leasing, rents, and production royalties on federal minerals would increase from current estimated levels ($2.3 million) to an estimated $2.8 million. From this, annual average revenues distributed to the counties would be about 1.6 million, an increase of about $210,000 (4-82).

Recreation: Economic impacts associated with recreation use on BLM land are summarized above under Impacts Common to All Alternatives.

***Timber Harvest*:** Average annual timber harvest would produce about 1,790 CCF of sawtimber. Current adjusted base period price of ponderosa pine that is used in appraising timber sales in the Black Hills zone is $41.94 per CCF (Forest Service Region 2, Appraisal Bulletin, Oct. 2010). Four percent of the revenue from timber sales on public domain goes to the state; and annual revenues from timber sales would be an estimated $75,000, of which about $3,000 would be distributed to the State of South Dakota.

Lands and Realty: The development of renewable wind energy on public lands would stimulate economic activity from the construction and operation of the towers and related infrastructure. ROW payments to federal government would also increase from current levels. One or more wind energy developments with a total of 121 towers (capacity of 424 MW) on BLM-administered lands would be anticipated with Alternative D. This would support up to 2,010 local jobs and an estimated $77.37 million in labor income during the two-year construction period (JEDI 2011). After the two-year construction period, average annual operation and maintenance would contribute about 70 jobs and $2.745 million in wage and proprietor's income. It would generate about $1.76 million in annual federal ROW rent revenues.

Government: Fire/fuels treatments would average 400 acres of mechanical treatments and 1,000 acres of prescribed burning. Average annual cost of pre-commercial thinning would be an estimated $212,000. Since most prescribed burning would be done by BLM personnel and cooperating agencies, costs of prescribed burning would be included in government operations costs.

Cumulative Impacts

Cumulative Impacts under Alternative A (Current Management)

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor and proprietor's income contributed by BLM land and resource management under Alternative A would be about 620 jobs and $24.1 million, respectively (Tables 4-81 and 4-82). This would be a 44 percent increase over current levels, attributable mostly to an expected increase in oil/gas leasing and wind energy development.

Average annual federal revenues from BLM land and mineral uses would be about $5.4 million per year. Annual payments to counties would be approximately $2.3 million, most of which would be related to oil and gas leasing, rent, and production royalties (Table 4-83).

The increase in total jobs from current levels (188) would result in an estimated total population increase of about 290 people and an increase of about 120 households.

Cumulative Impacts under Alternative B

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor and proprietor's income contributed by BLM land and resource management under Alternative B would be about 510 jobs and $20.2 million, respectively (Tables 4-81 and 4-82). This would be an 18 percent increase over current employment levels and a 20 percent increase over current income levels. Most of these increases would be attributable to an expected increase in oil/gas leasing and wind energy development. The largest employment and labor income effects would be related to oil and gas leasing, exploration, development, and production.

Average annual federal revenues from BLM land and mineral uses would be about $4.3 million per year. Annual payments to counties would be approximately $2.0 million, most of which would be related to oil and gas leasing, rent, and production royalties (Table 4-83).

The increase in total jobs from current levels (77) would result in an estimated total population increase of about 120 people and an increase of about 50 households.

Cumulative Impacts under Alternative C

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor and proprietor's income contributed by BLM land and resource management under Alternative C would be about 500 jobs and $19.8

million, respectively (Tables 4-81 and 4-82). This would be a 15 percent increase in employment and an 18 percent increase in income over current levels. Most of the increases would be attributable to an expected increase in oil/gas leasing and wind energy development. The largest employment and labor income effects would be related to oil and gas leasing, exploration, development, and production.

Average annual federal revenues from BLM land and mineral uses would be about $4.0 million per year. Annual payments to counties would be approximately $2.0 million, most of which would be related to oil and gas leasing, rent, and production royalties (Table 4-83).

The increase in total jobs from current levels (66) would result in an estimated total population increase of about 100 people and an increase of about 40 households.

Cumulative Impacts under Alternative D (Preferred Alternative)

Overall, the estimated total (direct, indirect, and induced) number of local jobs and associated local labor and proprietor's income contributed by BLM land and resource management under Alternative D would be about 530 jobs and $20.9 million, respectively (Tables 4-81 and 4-82). This would be a 22 percent increase in jobs and a 25 percent increase in income over current levels. Most of the increase would be attributable to an expected increase in oil/gas leasing and wind energy development. The largest employment and labor income effects would be related to oil and gas leasing, exploration, development, and production.

Average annual federal revenues from BLM land and mineral uses would be about $4.8 million per year. Annual payments to counties would be approximately $2.0 million, most of which would be related to oil and gas leasing, rent, and production royalties (Table 4-83).

The increase in total jobs from current levels (97) would result in an estimated total population increase of about 150 people and an increase of about 60 households.

Public Safety

Abandoned Mine Lands

Assumptions

Within the planning area, numerous hard rock mines in the Exemption Area and lands mined for bentonite as well as other small areas mined for sand, gravel, and uranium have been designated as Abandoned Mine Lands (AMLs) (see Glossary). These AMLs would be documented and placed in the BLM GIS system, and as the SDFO identifies AMLs having chemical or physical hazards, remedies would be undertaken.

The BLM would follow laws and regulations and BLM policy with regard to finding the best balance among reducing safety hazards to the public and hazards to the environment, preserving bat habitat, and preserving mine features as cultural resources. Reclaimed mine features would be monitored and maintained.

Impacts Common to All Alternatives

State and federal water quality standards would tend to be met over time after reclamation of any new AMLs discovered with acid mine drainage or related chemical problems. Productive soils and plant communities would be restored over time. Physical safety hazards would be remedied as discovered. Significant cultural resources would be protected where possible. Bat use of mine features would be inventoried, bat habitat would be protected, and bat populations would be supported.

Cumulative Impacts

Impacts would be negligible during reclamation activities, and beneficial in the long term under any of the alternatives.

Debris Flows

Assumptions

The SDFO will include the evaluation for the potential for debris flows in analyses done in the aftermath of wildfires, and will take appropriate measures after identification of such hazards.

Impacts Common to All Alternatives

Vegetative treatments to reduce fuel quantity would decrease the probability of large-scale fires, thus decreasing the probabilities of debris flows. In the event of large-scale fires, BAER teams would evaluate the situation and management would take measures to mitigate any remaining potential for debris flows.

Cumulative Impacts Common to All Alternatives

Cumulative impacts to debris flows would be very minor under any alternative.

Hazardous Materials

Assumptions

The SDFO will follow hazardous waste-related laws and regulations, and BLM policy with regard to management of hazardous wastes and spills that could occur.

Impacts Common to All Alternatives

Under all alternatives, environmental conditions would be protected as a result of hazardous waste or hazardous 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 minimize to the extent possible public exposure and environmental impacts.

In terms of health and safety, land use authorizations would not be issued for uses which 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 may lead to actions such as the modification or abandonment of a land ownership 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 comes an inherent risk associated with an increase in the amount of hazardous materials generated, used, transported, and stored. However, no substantial new hazardous materials uses 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. Any authorized use of hazardous materials adheres to federal and state requirements to reduce or eliminate impacts. Hazardous materials in the planning area are managed to reduce risks to visitors and employees, to restore contaminated lands, and to carry out emergency response activities, as per appropriate laws, policies, and regulations. An active remediation program remains in place under all alternatives. Indirect impacts related to risks from hazardous materials during remediation would exist.

The Black Hills Army Depot was used as a depot for storage and manufacture of chemical and conventional munitions for 25 years. During part or all of this time period, poor records were kept regarding the testing and/or disposal of chemical and conventional munitions, and precursor chemicals and wastes. Reportedly, many wastes were disposed of in trenches. The site has been characterized by the Army Corps of Engineers and the State of South Dakota. Engineering precautions need to be taken when disturbing the site. Many risks are not fully known.

For exploration of locatable minerals, a Notice or a Plan of Operations would be required. The requirement for one of these allows the BLM the ability to require the claimant to show that undue degradation does not occur and that potential hazardous materials are fully addressed before mining operations are allowed to proceed.

Impacts under Alternative A (Current Management)

There would be a slightly elevated chance of impacts in the case of disturbance of a former Minuteman Missile Site.

Impacts under Alternative B

There would be a slightly elevated chance of impacts in the case of disturbance of a former Minuteman Missile Site.

Mineral exploration and development at the abandoned Black Hills Army Depot Site (BHAD) would be NSO to leasable minerals, closed to salable minerals, and open to locatable minerals with standard stipulations. This would affect 12,709 subsurface acres.

Impacts under Alternative C

There would be a minimal chance of impacts in the case of disturbance of a former Minuteman Missile Site.

Mineral exploration and development at the abandoned Black Hills Army Depot Site (BHAD) would be closed to leasable and salable minerals, and open to locatable minerals subject to standard stipulations. This would affect 12,709 subsurface acres.

Impacts under Alternative D (Preferred Alternative)

There would be a minimal chance of impacts in the case of disturbance of a former Minuteman Missile Site.

Mineral exploration and development at the abandoned Black Hills Army Depot Site (BHAD) would be NSO to leasable minerals, closed to salable minerals, and open to locatable minerals with standard stipulations. This would affect 12,709 subsurface acres.

Cumulative Impacts Common to All Alternatives

No cumulative impacts to Public Safety would result from the implementation of any alternative.

Unavoidable Adverse Impacts

Unavoidable adverse impacts would result from actions where resources are considered permanently lost. The NEPA section 102(C) also mandates disclosure of "any adverse environmental effects which cannot be avoided should the proposal be implemented." These are impacts for which there are no mitigation measures or impacts that remain even after the implementation of mitigation measures. Implementation of the RMP and subsequent activity- or project-specific plan implementation would result in unavoidable adverse impacts to some resources.

Cultural Resources: Adverse impacts to cultural resources that cannot be avoided and/or mitigated include those impacts that occur to unknown cultural resources, such as unrecorded and/or buried sites which could be damaged, destroyed, vandalized and/or looted.

Fire Management and Ecology: Non-native plant species may establish and persist in areas that have had vegetation treatments, regardless of Integrated Pest Management actions and treatments. In some areas, vegetation treatments may facilitate increases in OHV travel because of reduced fuel loads on the forest floor. This reduction may increase the potential for new OHV trails to be created in treated areas.

Travel and OHV: Increased levels of vegetation treatments under Alternative D would indirectly increase levels of OHV Travel.

Forests and Woodlands Products: Non-native and exotic plants tend to invade disturbed areas. These undesirable plant species often establish themselves in areas after mechanical treatments and prescribed fires. However, with monitoring followed by treatments, long-term invasion can be avoided or mitigated.

Mechanical treatments change the way the forested landscape appears to some observers. The effect of timber cutting to observers is immediate following this activity. For planning purposes, forests are managed on a 100-year rotation. For the 20-year life of the RMP, the forest would likely look different and to some it may be considered a long-term impact; however, with respect to the more realistic time frame of forest management, there is little to no long-term adverse impact.

In many areas, mechanical treatments that involve temporary roads and trails tend to attract OHV travel because a pathway now exists. While a majority of riders stay on authorized trails, some do not. These unauthorized uses contribute to increased soil compaction, rutting, and weed infestations that can cause long-term adverse impacts.

Paleontological Resources: Inadvertent damage, destruction, vandalism, and/or looting of paleontological resources from increased public use and surface-disturbing activities would be unavoidable. Although mitigation measures would include identification and mitigation of resources prior to surface-disturbing activities, some unanticipated discoveries of unknown paleontological resources would occur. The number of sites anticipated to be inadvertently damaged is unknown. There is a high probability that the theft, damage, and/or destruction of paleontological resources would go undetected or the delay in detection would prohibit successful prosecution of theft, damage, and/or destruction.

Renewable Energy: Exclusion of wind energy development from specific areas, and the measures and/or restrictions imposed on developments in order to reduce, minimize or eliminate impacts to a number of resources, including but not limited to special status species, wildlife, scenic values, and cultural resources, would limit the ability of the BLM to provide opportunities for the production of wind energy from public land in the SDFO.

The land use restrictions required to meet legal requirements and protect sensitive resources and other important values would adversely impact the ability of operators, individuals, and groups to fully develop high potential wind resources in the SDFO.

Soils and Vegetative Communities – Rangeland: Vehicle travel during moist or wet soil conditions could lead to soil rutting and compaction in road travel ways and areas adjacent to roads. This would have the potential to increase surface runoff and soil erosion. Soil erosion and loss of soil quality would occur in open OHV areas. Prescribed and wildfires cause short-term localized runoff, soil erosion, and sedimentation. Under all alternatives, a small degree of livestock trampling (compaction, and/or exposure of bare soil) would occur. These areas would be limited to areas around livestock water sources, fence corners, and salt locations. Conservative stocking levels that have been established, along with continued implementation of Standards for Rangeland Health and Guidelines for Livestock Grazing Management, would limit trampling impacts to small, isolated areas under all alternatives.

Transportation and Facilities: Certain resource management actions would adversely impact the transportation program by placing limitations on transportation development.

Short-Term Uses versus Long-Term Productivity

This section discusses the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Air Quality: Facility construction could cause short-term increases in fugitive dust and engine exhaust emissions. Construction-related emissions would cease when facilities are completed, allowing ongoing resource recovery and economic benefits from long-term operations of the facilities.

Economics: Consumptive uses (mineral production, timber harvest) would be considered short-term uses that may influence and/or reduce long-term productivity of the land and mineral resources for future production. Development of minerals within the 20-year planning period would preclude the use of those minerals in the future.

Fire Management and Ecology: Vegetation treatments would cause short-term adverse impacts to soils, air quality, and other sensitive resources; however, maintenance or restoration of desired ecological conditions would improve landscape health in the long term.

Forests and Woodland Products: Under Alternatives B, C, and D any forest management activity would require a silvicultural prescription that considers proposed management activities and how they would be carried out to maintain site productivity, accommodate all resource values including biological diversity, as well as producing a free growing stand capable of meeting management objectives.

In the very short term (two to five years) immediately following treatments, site productivity would be lower than before treatments due to heavy equipment impacts, prescribed fire, or exotic plant invasion. However, in the long term, the productivity of native vegetation would likely increase due to a decrease in the stocking level (fewer trees) and the opening of the forest canopy which increases the amount of available moisture and sunlight to the forest floor and vegetation.

Noxious Weeds and Other Invasive Plant Species: Vegetation treatments and other authorized activities would cause short-term increase in noxious weeds and other invasive plant species. The long-term increase in productivity in vegetation from treatments would outweigh short-term impacts from increases in noxious weeds or invasive species. Implementation of BMPs and actions outlined in the management common to all alternatives would ensure that noxious weeds and other invasive species do not persist beyond pre-treatment levels.

Recreation: Short-term surface disturbance from harvesting timber and underburning the slash and vegetation left after the harvest would produce smoke, remove vegetation, and temporally increase soil erosion and degrade the scenery.

Although this land treatment would have a short-term effect in reducing recreational opportunities and degrading the quality of the recreational experience, long-term benefits from vegetation treatments and associated improved recreational opportunities and experiences far outweigh the lesser adverse effects from timber harvest and underburning. Generally, long-term benefits from vegetation treatment would include improving vegetation composition and wildlife habitat which, in turn, may improve scenery and should increase recreational opportunities for wildlife viewing, hiking, and hunting.

Soils and Vegetative Communities – Rangeland: Treatments and management activities to emphasize healthy conditions and restore desired ecological conditions of rangelands would subject these acres to short-term erosion and compaction effects on soils. Meeting long-term goals with these treatments would contribute to properly functioning watersheds that support productive plant communities and would improve soil quality in the long term. Also, on these treated acres the risk of high severity wildfires would be reduced.

Oil and gas activities affect soil and vegetation quality in both the short and long term. Well pads and pipelines undergo interim and final reclamation to return soil and vegetation quality in the short term. Access roads and production areas impact soil and vegetation resources in the long term. At the time of final abandonment, access roads and production areas are reclaimed. While reclamation actions stabilize soil and restore vegetative cover, these actions rarely result in restoration of the exact pre-disturbance conditions.

Wildlife: While vegetation treatments and other authorized activities may adversely impact some wildlife species in the short term, when properly conducted under the review of an interdisciplinary team, these activities generally maintain or improve productivity of wildlife habitat in the long term.

Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitment of resources would result from actions where resources are considered permanently changed. Section 1052.16 of the CEQ regulations requires that the discussion of environmental consequences include a description of "… any irreversible or irretrievable commitment of resources which would be involved in the proposal should it be implemented." An irreversible commitment of resources refers to decisions affecting the use of nonrenewable resources. Irreversible and irretrievable commitments of resources are described below.

Water: Depletion of water resources or reduction of water quality in the planning area may result in irretrievable commitment of water resources in the planning area as water that could contribute to watershed systems and other uses would be unavailable. Permanent flow alteration, increases in sediment, salinity and nonpoint source pollution are examples of concerns related to water quality and quantity. In most cases, these types of impacts would be irretrievable if they occurred on a large scale.

Cultural Resources: Effects to cultural resources from surface-disturbing activities, advances of time (such as weathering), destruction through development, and inadequate or inappropriate maintenance are all considered irretrievable and irreversible impacts to the resource. As a result, the research value of cultural resources can disappear and no longer have potential as interpretive sites, and cease to be a source of enhancement for present and future generations.

Economics: The use of non-renewable resources would eliminate potential economic uses of those resources in the future for the same or different purposes. This is generally assumed to apply to the use of mineral resources.

Fluid Minerals: Oil and gas is a non-renewable resource. Once the product has been produced, it would not be replaced.

Forests and Woodland Products: Unplanned high-severity events such as fire and windstorms can happen anytime and may alter soil properties and stand composition in such a manner that impacts are irreversible/irretrievable. However, utilizing sound silvicultural practices with monitoring to follow up treatments should not cause any irreversible/irretrievable problems.

Noxious Weeds and Other Invasive Species: Loss of habitat for plant and animal species and loss of forage for current and future wildlife and livestock would occur where control of weeds and invasive species is limited. Limited control would result in soil loss which would reduce site potential of an infested area so that it would no longer support desired plant communities. In some cases, recovery to existing conditions may not be possible even with a major influx of resources for control and restoration. Site preparation and seeding may not bring the site back to full potential, and noxious weeds and invasive species would continue to persist.

Paleontological Resources: Inadvertent damage, destruction, vandalism, and/or looting of paleontological resources from increased public use and surface-disturbing activities would be classified as both an irreversible and an irretrievable impact. Inadvertent damage and vandalism may render a paleontological resource irretrievable for a period of time until restoration efforts are completed. Destruction or looting of a paleontological specimen is an irreversible impact to the resource. Destruction and looting removes specimens from public ownership and prevents researchers from garnering knowledge from the location and specimen.

This RMP would allow scientific research of paleontological specimens. This research would have an irreversible impact on paleontological resources that are excavated; however, the knowledge gained from that research would have a beneficial effect on the scientific field as a whole.

Recreation: Locatable, leasable, and saleable solid minerals extraction creates open pits of small to moderate size, roads, and some temporary infrastructure in the landscape. Dispersed recreation opportunities associated with the open pit prior to excavation would be lost until the pits are reclaimed. Mining the pit is usually a long-term activity, but subsequent reclamation would provide conditions so the recreation opportunity would not be irretrievable. Existing visual features would be irretrievable. Dispersed recreation opportunities deferred would be greatest during the fall hunting season and, to a lesser degree, during spring and summer for people who enjoy pleasure driving, hiking, and horseback riding.

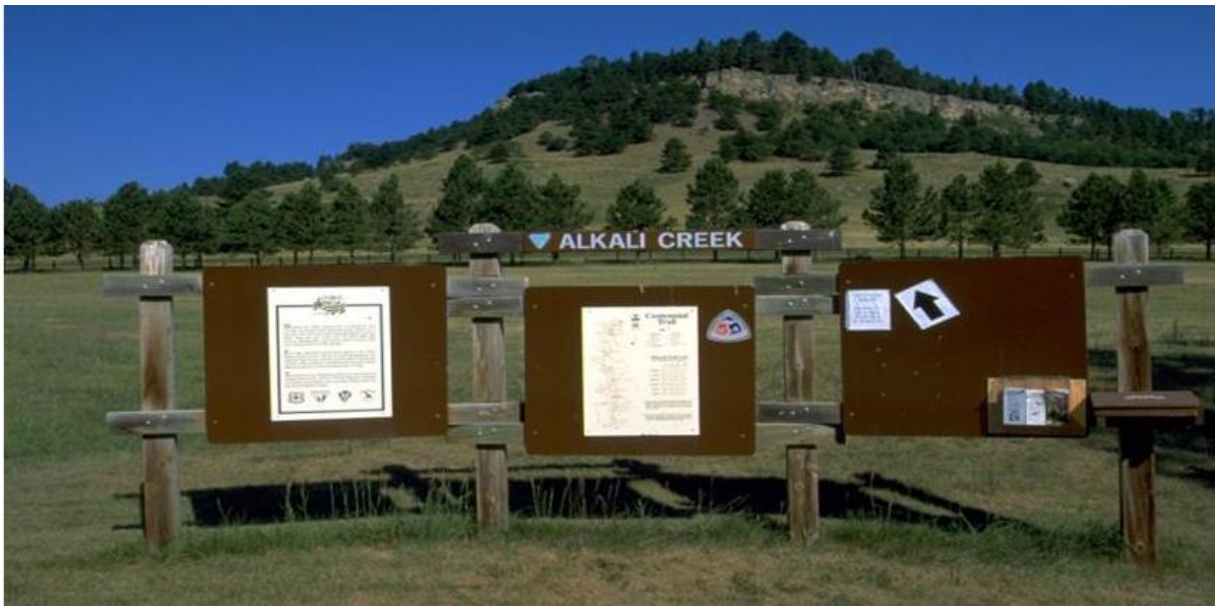
The transfer of approximately 150 acres of land in the Fort Meade ACEC would result in loss of recreational opportunity as these parcels of land are accessible and used by the public. Transfer of these lands would be an irreversible action. The key users impacted would be horseback riders, hikers, and sightseers.

The transfer of other BLM-administered lands would include small isolated tracts of public land surrounded by private lands. These lands have extremely limited access and receive limited public use. While the loss of the small isolated parcels of land would be irreversible, impacts to recreationists would be negligible.

Soils and Vegetative Communities – Rangeland: Soil formation requires thousands of years. Accelerated topsoil erosion would result in irretrievable loss of soil quality. Soil that erodes at a rate higher than natural, geological rates is considered irreversible. Under all alternatives, surface-disturbing activities would cause short-term, minor to moderate levels of erosion on a small scale. Implementation of BMPs and management actions outlined in the alternatives would result in long-term erosion levels that are at or below natural geologic rates of erosion. Under all alternatives, sedimentation movement into stream and river vegetation treatments would be negligible.

Wildlife: Under all alternatives, the transfer of BLM-administered lands would include small isolated tracts of public land surrounded by private lands. While most of these lands are not suitable for croplands, those parcels suitable may be converted to farmland if they are transferred to private ownership. This would result in a loss or change in wildlife habitat types.

Wind Facilities: The installations of wind facilities represent substantial infrastructure investment and are considered long-term uses of a landscape. These facilities are likely to remain as long as wind resources continue to provide generation. As a result, renewable energy development authorizations could permanently alter natural and cultural resources and uses of lands where authorized, and lead to an irretrievable conversion of lands to facility development for the life of the project.



Fort Meade Recreational Area BLM Photo